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**CRATÆGUS IN PENNSYLVANIA. II.**

BY C. S. SARGENT.

Since the publication in the PROCEEDINGS of the Academy for 1905 of my paper on *Cratægus* in Eastern Pennsylvania a further systematic study of the genus in other parts of the State has been made. The results of these studies appear in the following paper. Additional observations have also been made in Delaware, Chester and Monroe Counties by Mr. B. H. Smith, in Bucks County by Dr. C. D. Fretz, and in Berks County by Mr. C. L. Gruber. In Lackawanna County, at Scranton and in its neighborhood, where the genus is largely represented in many distinct forms, important collections have been made by Mr. A. Twining. The region surrounding Orbisonia, in Huntingdon County, has been carefully explored by Mr. B. H. Smith, who has also collected for several seasons near Bedford in Bedford County, near Altoona in Blair County, and at Wilmore and Portage in Cambria County. Prof. O. E. Jennings has placed at my disposal very large collections accompanied by valuable notes made by him and his wife near Pittsburg, in Allegheny County, and in Washington, Westmoreland and Armstrong Counties. Without the assistance and careful observations of all these collectors the publication of this paper would have been impossible.

To Mr. Smith I am under special obligations. He has been my guide and companion during a number of journeys made during the last five years through many of the *Cratægus* fields of the State; he has enriched his specimens by the most carefully prepared notes and with excellent sketches of the fruit of many species, and he has been a constant and untiring adviser during the preparation of this paper, which has occupied my attention for several years.

The field is by no means exhausted; a large part of the State has never been visited by careful observers of *Cratægus*, and in the regions where the genus has been the most carefully examined, plants occur which are still imperfectly known; and before it is possible to prepare a third paper on the *Cratægus* of the State, collections must be made over large territories, and these collections, it is to be hoped, will not be long delayed.

## SYNOPSIS OF GROUPS.

- A.—Nutlets without ventral cavities (Groups *Crus-galli*–*Anomalæ*).  
 B.—Nutlets with longitudinal cavities on their ventral faces (Group *Tomentosæ*).

## CRUS-GALLI.

Leaves subcoriaceous or less commonly thin, obovate to oblong-obovate, acuminate, acute, acuminate or rounded at the apex, usually serrate only above the middle, without lobes except on vigorous shoots, their veins usually thin and often within the parenchyma; petioles short, usually eglandular; flowers in many-flowered glabrous corymbs; fruit subglobose to short-oblong or oval, mostly 1–1.4 cm. in diameter; flesh thin, usually green.

Anthers rose color or pink.

Leaves subcoriaceous, their veins mostly within the parenchyma; stamens 10; anthers dark rose color.....1. *C. crus-galli*.

Leaves thin, their veins more or less prominent.

Leaves usually rounded at the apex; stamens usually 10; anthers pink; spines few.....2. *C. trahax*.

Leaves acuminate at the apex.

Stamens 10; calyx-lobes long, slender, entire.

Fruit short-oblong; anthers pale pink; branchlets and spines olive green.....3. *C. olivacea*.

Fruit narrow-oval; anthers rose color; branchlets and spines bright chestnut brown.....4. *C. accincta*.

Stamens 15; calyx-lobes short, glandular-dentate; anthers only faintly tinged with pink; branchlets and spines light brown.....5. *C. phlebodia*.

Anthers white or pale yellow; stamens 10 or less.

Leaves subcoriaceous, rounded or acute at the apex; fruit narrow oblong-obovate to oval; spines dark purple, 2–3 cm. in length.

6. *C. eburnea*.

Leaves thin, acute or acuminate at the apex; fruit short-oblong to ovate; spines light reddish brown, 4–5 cm. in length.

7. *C. aliena*.

1. *Cratægus crus-galli* Linnæus.

Spec. 476 (1753); Sargent, *Silva N. Am.*, IV, 91, t. 178; Man., 368, f. 286; Proc. Acad. Nat. Sci. Phila., 1905, 379.

Rich hillsides, Bedford, Bedford County, B. H. Smith and C. S. Sargent (No. 302), September 30, 1905, May 25, 1908; B. H. Smith, September 16, 1908; also from Canada to North Carolina.

The number 302 from Bedford represents a number of large shrubs with erect branches forming narrow irregular heads. This habit is quite unlike that of the typical form of *Cratægus crus-galli* but in other respects they are similar to that species as it grows in eastern Pennsylvania.

2. *Crataegus trahax* Ashe.

Jour. Elisha Mitchell Sci. Soc., XIX, pt. I, 27 (1903); Gruber, Proc. Berks County Nat. Sci. Club, I, 21 (*Crataegus* in Berks County, II).

*Crataegus crus-galli* Sargent, Proc. Acad. Nat. Sci. Phila., 1905, 579 (in part) (not Linnæus).

Glabrous with the exception of the hairs on the upper side of the midribs. *Leaves* oblong-obovate, rounded or rarely acute at the broad apex, gradually narrowed to the cuneate base, and finely serrate above the middle, with incurved glandular teeth; nearly fully grown when the flowers open from the 20th to the 27th of May and then thin, yellow-green, sparingly villose along the upper side of the midribs, with mostly persistent hairs and paler below, and at maturity thin, dark yellow-green and very lustrous on the upper surface, pale yellow-green on the lower surface, 4–5.5 cm. long and 2–2.5 cm. wide, with thin midribs and slender more or less prominent primary veins; petioles stout, slightly wing-margined nearly to the base, 6–7 mm. in length; leaves on vigorous shoots usually acute or acuminate, coarsely serrate, often 7–8 cm. long and 3.5–4 cm. wide, with thick midribs and prominent primary veins. *Flowers* 1.3–1.8 cm. in diameter, on long slender pedicels, in wide usually 10–15- but occasionally 30-flowered corymbs, the much elongated lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, the lobes long, slender, acuminate, entire or occasionally slightly glandular near the base, reflexed after anthesis; stamens 5–15, usually 10; anthers pink; styles 1 or rarely 2. *Fruit* ripening early in October and usually remaining until November on the branches, on long slender drooping pedicels, in few-fruited clusters, subglobose to short-oblong, maroon or dark crimson, often blotched with dark green at the apex, dull, slightly pruinose, 1–1.3 cm. long and 8–13 mm. wide; calyx little enlarged, with a broad obconic cavity, and erect and slightly incurved persistent lobes; flesh bitter, greenish yellow; nutlet usually 1, narrowed and rounded at the apex, broader and rounded at the base, slightly ridged, 6–7 mm. long and 4–5 mm. in diameter.

A tree 4 or 5 m. high, with a short trunk 2–3 dm. in diameter, covered with dark gray bark, numerous large horizontal ascending or drooping branches forming a broad rounded head, and slender only slightly zigzag branchlets light orange-brown and marked by large pale lentils when they first appear, becoming light reddish brown in their first season and dull gray the following year, and unarmed or armed with occasional stout spines 3–3.5 cm. long.

Bluffs along Tulpehocken Creek, North Heidelberg Township, Berks County; common; C. L. Gruber, (No. 105) May 27, August 2 and

September 16, 1905; (No. 45) May 29, August 1 and September 25, 1905, May 25 and 26, 1906.

From *Cratægus crus-galli* Linnæus this plant differs in its thinner leaves with more prominent veins, in the pink, not dark rose-colored, anthers and in the size and shape of the fruit. Mr. Gruber, who has watched carefully during several seasons the trees of these two forms growing near together, is convinced that *Cratægus trahax* should be specifically distinguished. A plant in an old hedge on Island Road, West Philadelphia, B. H. Smith (No. 221), June 3, 1903, probably belongs to this species.

3. *Cratægus olivacea* n. sp.

Glabrous with the exception of the hairs on the upper surface of the young leaves. *Leaves* oblong-obovate, acuminate at the ends or sometimes acute at the apex, and sharply often doubly serrate above the middle, with straight glandular teeth; about half-grown when the flowers open late in May and then thin, dark yellow-green, smooth, lustrous and glabrous above with the exception of occasional hairs on the midribs, and pale and glabrous below, and at maturity thin but firm in texture, dark green and lustrous on the upper surface, light yellow-green on the lower surface, 5.5–7 cm. long and 3–3.5 cm. wide, with stout midribs and thin very prominent primary veins; petioles stout, wing-margined often to the middle, glandular, with minute often persistent glands 2–2.2 cm. in length; leaves on vigorous shoots thicker, more coarsely serrate, occasionally slightly lobed toward the apex, 7–10 cm. long and 3.5–4 cm. wide. *Flowers* on long slender pedicels, in wide, lax, mostly 14–20-flowered, corymbs, with linear glandular bracts and bractlets fading brown and generally deciduous before the flowers open, the elongated lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, the lobes long, slender, entire, reflexed after anthesis; stamens 10; anthers pale pink; styles 2. *Fruit* ripening the end of September, on long slender drooping red pedicels, in few-fruited clusters, short-oblong, full and rounded at the ends or slightly narrowed at the base, dull red, marked by numerous large dark dots, 1–1.2 cm. long and 8–10 mm. in diameter; calyx little enlarged, with a wide shallow cavity, and small spreading and appressed lobes; flesh thin, green, dry and hard; nutlets 2, broad and rounded at the apex, narrow and rounded at the base, ridged on the back with a high broad grooved ridge 6–7 mm. long and 4–4.5 mm. wide.

A tree 7–9 m. high, with a tall trunk sometimes 3 dm. in diameter, covered with dark fissured and scaly bark, large wide-spreading

branches forming a symmetrical round-topped head, and slender nearly straight branchlets dark green more or less tinged with red and marked by pale lenticels when they first appear, becoming dark olive green in their first season and dull reddish brown the following year, and armed with numerous slender straight olive green, ultimately dark brown, spines 3–3.5 cm. long.

Deep bottom lands, on the Little Juniata River, near Elizabeth Furnace, East Altoona, Blair County, B. H. Smith, (No. 280 type) May 22, 1905, B. H. Smith and C. S. Sargent, September 27, 1905.

Distinct in the olive green color of the branchlets and spines.

4. *Crataegus acinota* n. sp.

Glabrous. *Leaves* oblong-ovate, acute or acuminate or rarely rounded and short-pointed at the apex, gradually narrowed to the long slender entire base, and finely serrate above the middle, with straight glandular teeth; about half-grown when the flowers open at the end of May and then very thin, dull bluish green above and paler below, and at maturity thin, dark green, 4.5–5 cm. long and 1.5–2 cm. wide, with thin prominent midribs and thin primary veins; petioles slender, narrowly wing-margined to below the middle, often rose-color in the autumn, 4–8 cm. in length; leaves on vigorous shoots obovate, acuminate and long-pointed at the apex, coarsely doubly serrate, and often 6 cm. long and 3.5–4 cm. wide, with stout broadly winged petioles. *Flowers* 1–1.2 cm. in diameter, on long slender pedicels, in broad, lax, 15–20-flowered corymbs, the lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, the lobes long, slender, acuminate, entire, reflexed after anthesis; stamens 7–10, mostly 10; anthers rose color; styles 1 or rarely 2. *Fruit* ripening in October, on long slender pedicels, in drooping many-fruited clusters, narrow-oval, scarlet, lustrous, marked by long pale lenticels, 1.2–1.4 cm. long and 7–8 cm. in diameter; calyx little enlarged, with a narrow deep cavity pointed in the bottom, and spreading and appressed persistent lobes; flesh thin, yellow, dry and mealy; nutlet rounded at the apex, gradually narrowed to the rounded base, slightly and irregularly ridged, 8–9 mm. long and 4–4.5 mm. in diameter, or when 2 gradually narrowed and rounded at the ends, more prominently ridged on the back and 3–4 mm. wide.

A tree 7–8 m. high, with a trunk sometimes 2 dm. in diameter covered with light gray scaly bark, spreading branches forming a round-topped head, and slender slightly zigzag branchlets light orange-green when they first appear, becoming light chestnut brown and lustrous in their first season and dull red-brown the following year,

and armed with very numerous slender, straight or slightly curved chestnut brown spines 2.5–5 cm. long.

McKees Rocks, Allegheny County, O. E. Jennings, B. H. Smith and C. S. Sargent, (No. 24 type) September 28, 1905, O. E. Jennings, May 24, 1906.

5. *Crataegus phlebodia* n. sp.

Glabrous. *Leaves* narrowly obovate, acuminate gradually contracted to the long slender concave-cuneate base, and finely often doubly serrate, with straight or incurved glandular teeth; more than half-grown when the flowers open late in May and then thin, yellow-green, smooth and lustrous above, pale below, and at maturity thin, dark yellow-green on the upper surface, paler on the lower surface, 3.5–5 cm. long and 2–2.2 cm. wide, with thin very prominent mid-ribs and primary veins; petioles slender, narrowly wing-margined to below the middle, 8–10 mm. in length. *Flowers* 1.8–2 cm. in diameter, on long slender glabrous pedicels, in mostly 10–18-flowered corymbs, the long lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, the lobes short, slender, acuminate, minutely glandular-dentate near the middle, reflexed after anthesis; stamens 15–20; filaments persistent on the ripe fruit; anthers faintly tinged with pink; styles 1–3. *Fruit* ripening the end of September, on slender drooping pedicels, in few-fruited clusters, short-oblong, full and rounded at the ends, dull scarlet, blotched with green at the apex, marked by large pale dots, 1–1.2 cm. long and nearly as broad; calyx little enlarged, with a narrow deep cavity pointed in the bottom, and small spreading often deciduous lobes; flesh thin, yellow-green, dry and hard; nutlets 1–3, full and rounded at the ends or sometimes acute at the base, ridged on the back, with a high broad ridge, 7.5–8 mm. long and 4–4.5 mm. wide, or, when 1, 5–5.5 mm. in diameter.

A tree sometimes 5–6 m. high, with a trunk 2.5–3 dm. in diameter covered with pale scaly bark, large erect and spreading branches forming an oblong round-topped head, and slender only slightly zigzag branchlets dark orange-green and marked by pale lenticels when they first appear, becoming light orange-brown in their first season and pale gray-brown the following year, and armed with many slender straight or slightly curved light brown spines 4–5 cm. long, and very numerous and compound on old stems and branches.

Border of oak woods, near Bedford Springs, Bedford County, B. H. Smith and C. S. Sargent, (No. 295 type) September 30, 1905; B. H. Smith, May 18, 1906; Orbisonia, Huntingdon County, B. H. Smith, (No. 316) May 20, 1906, October, 1907.

The flowers of number 295, from Orbisonia, have usually only 6–10 stamens. In other respects the two plants appear to be very much alike.

6. *Crataegus eburnea* Ashe.

Ann. Carnegie Mus., I, pt. III, 393 (1902).

Glabrous. *Leaves* oblong-obovate, rounded or acute at the apex, gradually narrowed to the concave-cuneate entire base, and finely often doubly serrate above, with straight or incurved glandular teeth; about half-grown when the flowers open in the first week of June and then thin, dark yellow-green, smooth and lustrous above and paler below, and at maturity subcoriaceous, dark yellow-green and very lustrous on the upper surface, paler on the lower surface, 4.5–5 cm. long, 2.5–3 cm. wide, with thin prominent midribs and primary veins; petioles stout, narrowly wing-margined nearly to the base, occasionally glandular early in the season, with deciduous glands, 6–8 mm. in length. *Flowers* about 1.4 cm. in diameter, on slender pedicels in broad many-flowered corymbs, the long lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, the lobes long, slender, acuminate, entire, reflexed after anthesis; stamens 8–10; anthers white; styles 1 or 2. *Fruit* ripening in October, on long drooping pedicels, in few-fruited clusters, oblong-obovate to oval, narrowed and rounded at the apex, more gradually narrowed and pointed at the base, dark red, 1.3–1.4 cm. long and 9–10 mm. in diameter; calyx little enlarged, with a deep narrow cavity pointed in the bottom, and slender reflexed persistent lobes; flesh thin, yellow-green, dry and hard; nutlets 1 or 2, obtuse at the apex, slightly narrowed at the base, ridged on the back, with a low narrow ridge, 7–8 mm. long and about 3 mm. wide, or when 1 about 1.5 mm. in diameter.

A tree sometimes 7–8 m. high, with a short trunk 2–2.5 dm. in diameter covered with light gray bark broken into rectangular scales, stout wide-spreading branches forming a broad round-topped head, and slender straight or slightly zigzag branchlets dark orange-green and marked by small pale lenticels when they first appear, becoming dark purple and lustrous in their first season and dark brown the following year, and armed with slender straight or slightly curved purple spines 2–3 cm. long, and occasionally persistent and becoming much elongated and branched on old stems.

Darlington Hollow, Sharpsburg, Allegheny County, J. A. Shafer, (No. 22, the type tree) June 8 and October, 1901, May 28, 1902, O. E. Jennings, (No. 98) June 16, 1908.



This is one of the largest and most abundant species in the neighborhood of Pittsburg.

7. *Cratægus aliena* n. sp.

Glabrous with the exception of the hairs on the young leaves. *Leaves* oblong-obovate, acute or acuminate, gradually narrowed to the concave-cuneate entire base, and sharply often doubly serrate usually only above the middle, with straight glandular teeth; nearly half-grown when the flowers open from the middle to the 20th of May and then thin, dull yellow-green, smooth and glabrous above with the exception of a few hairs on the upper side of the midribs and paler below, and at maturity thin but firm in texture, dark green and very lustrous on the upper surface, pale yellow-green on the lower surface, 4-5 cm. long and 2-2.5 cm. wide, with thin prominent midribs and primary veins; petioles stout, narrowly wing-margined nearly to the base, occasionally glandular early in the season, rose color in the autumn, 7-8 mm. in length; leaves on vigorous shoots subcoriaceous, abruptly long-pointed at the apex, more coarsely serrate, occasionally slightly lobed, often 5-6 cm. long and 4-5 cm. wide. *Flowers* 1.2-1.4 cm. in diameter, on long slender pedicels, in broad mostly 12-15-flowered corymbis, the elongated lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, the lobes long, slender acuminate, entire or minutely dentate, reflexed after anthesis; stamens 10; anthers light cream color; styles 1 or 2, usually 2. *Fruit* ripening early in October, on long drooping red pedicels, in few-fruited clusters, short-oblong to slightly obovate, crimson, lustrous, marked by large pale dots, 1-1.2 cm. long and 9-10 mm. in diameter; calyx little enlarged, with a narrow deep cavity pointed in the bottom, and small spreading often deciduous lobes; flesh thin and hard; nutlets 1 or 2, gradually narrowed and rounded at the ends, ridged on the back, with a high broad slightly grooved ridge, 7.5-8 mm. long and 4-4.4 mm. wide, or when 1, 6-6.5 mm. in diameter.

A tree 5 or 6 m. high, with a tall trunk 1.5-2 dm. in diameter and covered with dark scaly bark, small spreading branches forming a wide round-topped symmetrical head, and stout only slightly zigzag branchlets light orange-green and marked by pale lenticels when they first appear, becoming light reddish brown in their first season and gray tinged with red the following year, and armed with numerous stout nearly straight light red-brown spines 4-5 cm. long.

Hillsides, valley of Blacklog Creek, near Orbisonia, Huntingdon County, B. H. Smith, (No. 309, type) May 19 and October 9, 1906, October 8, 1907.

## 2. PUNCTATÆ.

Leaves thin to subcoriaceous, obovate-cuneate, usually more or less lobed above the middle; petioles short; anthers rose-colored or pink (sometimes pale yellow in one variety of No. 1); fruit subglobose to ellipsoidal or oval, usually more or less flattened at the ends, punctate, up to 3 cm. in diameter; flesh dry and mealy; nutlets 2-5, prominently ridged on the back.

Stamens usually 20.

Anthers rose color or yellow; leaves, corymbs and calyx more or less densely villose.....1. *C. punctata*.

Anthers pink; calyx glabrous.

Leaves oblong-obovate; pedicels glabrous.....2. *C. calvescens*.

Leaves broad-obovate to orbicular-obovate or elliptical; pedicels slightly villose.....3. *C. recedens*.

Stamens 8-14; anthers pink; leaves oblong-obovate, only slightly lobed.

Flowers on stout slightly villose pedicels, in 7- or 8-flowered corymbs; anthers pale pink; fruit subglobose to short-oblong.

4. *C. porrecta*.

Flowers on slender glabrous pedicels, in 14-20-flowered corymbs; anthers light rose pink; fruit ellipsoidal to oval...5. *C. præstans*.

1. *Cratægus punctata* Jacquin.

Hort. Vind., I, 10, t. 28 (1770); Sargent, Silva N. Am., IV, 103, t. 184; Man., 389, f. 308; Proc. Acad. Nat. Sci. Phila., 1905, 583; Gruber, Bull. Torrey Bot. Club, XXXII, 389.

*Cratægus punctata mutabilis* Gruber, Bull. Torrey Bot. Club, XXXII, 390 (1905).

*Cratægus Moselemensis* Gruber, Bull. Torrey Bot. Club, XXXII, 391 (1905).

*Cratægus Moselemensis corrugata* Gruber, Bull. Torrey Bot. Club, XXII, 391 (1905).

*Cratægus Triosteum* Gruber, Bull. Torrey Bot. Club, XXXII, 392 (1905).

Orbisonia, Huntingdon County, B. H. Smith (No. 307), May 19, 1906; Valley of the Conemaugh between Portage and Wilmore, Cambria County, B. H. Smith, (No. 272, with small green fruit) May 21, 1905, B. H. Smith and C. S. Sargent, September 26, 1905; valley of the Little Juniata River below Altoona, Blair County, B. H. Smith, (Nos. 259 and 261) May 20, 1905; near Carnot, back of Stoops' Ferry, Allegheny County, O. E. Jennings and B. H. Smith, (No. 89) October 6, 1907; near Linesville, Crawford County, O. E. Jennings, (Nos. 80 and 81) June 12 and October 9, 1907, (No. 90) October 9, 1907, May 28, 1908; Lincoln Heights, Scranton, Lackawanna County, A. Twining, (Nos. 7 and 8) June 8, 1907; Campbell's Ledge, Luzerne County, A. Twining, May 30, 1907.

*Cratægus punctata* is one of the most generally and widely distributed species of northeastern North America. It varies greatly in the size of the leaves, the amount of pubescence on the leaves,

corymbs and young branches, and in the size and color of the fruit, which varies from dark red to light yellow and green. The most distinct of these varieties has yellow anthers and yellow fruit often with a reddish cheek. This has sometimes been considered a species, but individuals occur on which flowers with rose-colored and with yellow anthers, and with red and yellow fruits, may occasionally be found. The yellow fruited form is

*Cratægus punctata* var. *aurea* Aiton, Hort. Kew., II, 170 (1789).

*Cratægus crocata* Ashe, Ann. Carnegie Mus. I, pt. 3, 389 (1902); Gruber, Berks County Nat. Sci. Club, II, 21 (*Cratægus* in Berks County); Bull. Torrey Bot. Club, XXXII, 390.

*Cratægus cydonia* Gruber, Bull. Torrey Bot. Club, XXXII, 390 (1905).

O'Hara Township, Allegheny County, J. A. Shafer, (No. 25) May 20 and October 10, 1902; W. Scott Farm, Moon Township west of Carnot, Allegheny County, J. A. Shafer, June 3 and October 26, 1902; Wildwood Park, Allegheny County, O. E. Jennings, (No. 92) October 14, 1907; not rare in the eastern part of the State, and most abundant in the region adjacent to Lakes Ontario and Erie.

A form densely hoary-tomentose on the under surface of the leaves and on the corymbs is

*Cratægus punctata* var. *canescens* Britton.

Bull. Torrey Bot. Club, XX, 231 (1894); Sargent, Man., 389; Proc. Acad. Nat. Sci. Phila., 1905, 583.

In Pennsylvania this form has been noticed only in Durham, Bucks County, and near Stroudsburg, in Monroe County.

A form with remarkably small leaves, flowers and fruits may be called

*Cratægus punctata* var. *microphylla* n. var.

*Leaves* obovate, acute, prominently veined, 2–2.5 cm. long and 1–1.2 cm. wide. *Flowers* in compact few-flowered corymbs, 1–1.4, mostly 1.2 cm. in diameter; stamens 18–20; anthers rose color. *Fruit* on short pedicels, depressed-globose, dark red, 8–10 mm. long and 10–12 mm. wide.

In a moist pasture, Linesville, Crawford County, O. E. Jennings, (No. 83 type) June 12 and October 9, 1907.

## 2. *Cratægus calvescens* n. sp.

Glabrous with the exception of the hairs on the upper side of the young leaves and petioles and on the calyx-lobes. *Leaves* oblong-obovate, acute, broad and rounded or acuminate and usually abruptly short-pointed at the apex, gradually narrowed to the concave-cuneate entire base, and coarsely often doubly serrate above the middle, with

straight glandular teeth; half-grown when the flowers open early in June and then thin, yellow-green, smooth, lustrous and slightly hairy on the midribs above and paler below, and at maturity thin but firm in texture, glabrous, dark yellow-green on the upper surface, paler on the lower surface, 4-6 cm. long and 2.5-3 cm. wide, with thin prominent midribs, and slender conspicuous veins extending very obliquely toward the apex of the leaf; petioles stout, narrowly wing-margined to below the middle, sparingly villose on the upper side while young, soon becoming glabrous, 1-1.5 cm. in length; leaves on vigorous shoots abruptly pointed and acuminate at the apex, more coarsely serrate, usually slightly and irregularly lobed and often 6-7 cm. long and 4.5-5 cm. wide. *Flowers* 2-2.2 cm. in diameter, on long stout pedicels, in broad lax mostly 10-18-, usually 12-15-flowered corymbs, the elongated lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, the lobes long, slender, acuminate, irregularly glandular-serrate near the middle, glabrous on the outer surface, slightly villose on the inner surface, reflexed after anthesis; stamens 12-20, usually 20; anthers pink; styles 2-4, usually 3. *Fruit* ripening early in October, on long drooping pedicels, in lax 2-7-flowered corymbs, subglobose, truncate at the apex, rounded at the base, dark red, marked by large dark dots, more or less pruinose, becoming lustrous, 1.5 cm. in diameter; calyx little enlarged, with a deep narrow cavity, and small spreading and appressed usually persistent lobes; flesh yellow-green, hard and bitter; nutlets usually 3, slightly narrowed and rounded at the ends, usually ridged on the back, with a high narrow ridge, 8-9 mm. long and 5-5.5 mm. wide.

A tree 6-7 m. high, with a tall trunk covered with gray scaly bark, and often 2.5 dm. in diameter, large wide-spreading branches forming a round-topped symmetrical head, and stout nearly straight branchlets, pale orange-green when they first appear, becoming light orange-brown and lustrous in their first season and dark gray-brown the following year, and armed with numerous stout nearly straight purple ultimately dark brown spines 3.5-5 cm. long.

Stony ridges and slopes; common; Riverview Park, Allegheny, Allegheny County, O. E. Jennings and Grace E. Kinzer, (No. 29 type) October 2, 1905, May 24, 1906, O. E. Jennings, June 8 and October 14, 1907, (No. 66) O. E. Jennings, October 8, 1906, June 2, 1907, (No. 26) O. E. Jennings, October 14, 1907, (No. 27) O. E. Jennings, October 14, 1907; Nine-mile Run, near Pittsburgh, Allegheny County, O. E. Jennings, (No. 39) October 9, 1905 (No. 44) October 10, 1909, O. E. Jennings and B. H. Smith, (No. 88) October 5, 1907; Idlepark. West-

moreland County, (No. 86) O. E. Jennings, September 21, 1907; rich hillsides, Bedford, Bedford County, B. H. Smith and C. S. Sargent, (No. 301) September 30, 1905, B. H. Smith, May 18, 1906.

The leaves of the Bedford County plant are usually acuminate, or they are acute and do not show on the specimens collected by Mr. Smith any tendency to become broad and rounded at the apex—a form which is not uncommon on trees in the neighborhood of Pittsburg. The young leaves of the Bedford County plants are slightly more hairy along the upper side of the midribs, and the spines are rather lighter colored. Otherwise they appear identical with the type of the species.

3. *Cratægus recedens* n. sp.

*Leaves* broad obovate to orbicular-obovate or rarely elliptical, acute or acuminate and often abruptly pointed at the apex, gradually narrowed to the cuneate or rarely rounded entire often unsymmetrical base, sharply doubly serrate above, with straight glandular teeth, and slightly divided above the middle into 4 or 5 pairs of slender acuminate spreading lobes; more than half grown when the flowers open about the 20th of May and then thin, yellow-green, roughened above by numerous white hairs and sparingly villose on the midribs and veins below, and at maturity thin, dull deep yellow-green, smooth and glabrous or occasionally scabrate above and pale and still slightly villose below on the thin prominent midribs and 6 or 7 pairs of thin primary veins extending obliquely toward the apex of the leaf, 4.5–5.5 cm. long and 3.5–4.5 cm. wide; petioles slender, wing-margined at the apex, villose early in the season, becoming nearly glabrous, 1.5–3 cm. in length; leaves on vigorous shoots more coarsely serrate and more deeply lobed and often 7–8 cm. long and broad. *Flowers* 1.8–2.2 cm. in diameter, on long stout slightly hairy pedicels, in broad 5–15-flowered corymbs, the lower peduncles from the axils of upper leaves; calyx-tube broadly obconic, glabrous, the lobes gradually narrowed from wide bases, long, acuminate, minutely glandular-serrate below the middle or entire, glabrous on the outer, sparingly villose on the inner surface, reflexed after anthesis; stamens 18–20; anthers pink; styles 3–5. *Fruit* ripening early in October, on slender glabrous or slightly hairy erect or spreading pedicels, in few-fruited clusters, nearly globose, sometimes slightly tapering toward the base, dark red more or less blotched with green or russet green, hardly punctate, glabrous or rarely puberulous, 1.1–1.5 cm. in diameter; calyx prominent, with a long tube, a wide deep cup-shaped cavity, and elongated reflexed persistent lobes hairy on the upper surface;

flesh yellowish green, firm and bitter; nutlets 3-5, rounded at the broad base, narrow and, when 5, acute at the apex, rounded and ridged on the back, with a broad grooved ridge, 7-7.5 mm. long and 4-4.5 mm. wide.

A tree 6-7 m. high, with a short trunk sometimes 1.6 dm. in diameter and covered with gray scaly bark, long slender horizontal or drooping branches, stout nearly straight branchlets dark orange-green, slightly pubescent and marked by small pale lenticels when they first appear, becoming light orange-brown in their first season and dull reddish brown and glabrous the following year, and armed with numerous slender nearly straight chestnut brown shining spines 3-5 cm. long, persistent and becoming compound and sometimes 10 cm. in length on old stems and branches.

Borders of woods at Indian Dale, near Kutztown, Berks County, C. L. Gruber, (No. 227 type) August 4 and October 2, 1905, May 19 and 22, 1906.

Very distinct from *C. punctata* Jacquin in the shape of the thin nearly glabrous leaves with much more slender veins, in the glabrous calyx-tube and only slightly hairy corymbs, and in its smaller globose hardly punctate fruit which is rounded and not truncate at the ends.

4. *Crataegus porrecta* Ashe.

Ann. Carnegie Mus., I, pt. III, 391 (1903).

*Leaves* oblong-obovate, acute or acuminate and often abruptly pointed at the apex, gradually narrowed to the long concave-cuneate entire base, coarsely doubly serrate usually only above the middle, with large straight glandular teeth, and often slightly divided toward the apex into 4 or 5 pairs of narrow acuminate lobes; nearly fully grown when the flowers open early in May and then dark yellow-green, smooth, lustrous and glabrous with the exception of a few hairs on the midribs above, and paler and sparingly villose on the midribs below, and at maturity thin but firm in texture, dark yellow-green on the upper surface, paler on the lower surface, 6-8 cm. long and 3.5-4 cm. wide, with thick midribs and thin prominent primary veins; petioles stout, narrowly wing-margined nearly to the base, slightly hairy on the upper side while young, soon becoming glabrous, occasionally glandular, 1-1.5 cm. in length. *Flowers* 1.5-1.7 cm. in diameter, on long stout slightly villose pedicels, in small compact mostly 7- or 8-flowered corymbs, the much elongated lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, slightly villose, the lobes long, slender, acuminate, entire or occasionally minutely dentate near the middle, glabrous, reflexed after

anthesis; stamens 8-14; anthers pale pink; styles 2 or 3. *Fruit* on long drooping pedicels, in few-fruited clusters, subglobose to short-oblong, flattened at the ends, russet-green to dark purplish red, pruinose, becoming lustrous, 1.1-1.4 cm. in diameter; calyx little enlarged, with a deep narrow cavity, and small spreading often deciduous lobes; flesh thin, light yellow-green, hard and bitter; nutlets 2 or 3, obtuse at the ends, irregularly grooved, often pentagonal, 9-10 mm. long and 5-6 mm. wide.

A tree sometimes 5 m. high, with a trunk 2-2.5 dm. in diameter and covered with dark gray bark separating in large flakes, large wide-spreading horizontal branches forming a flat-topped head, and stout nearly straight glabrous branchlets, light orange-green more or less tinged with red when they first appear, becoming dark chestnut-brown and lustrous in their first season and darker-colored the following year, and armed with numerous slender straight chestnut brown spines 3.5-5 cm. long, persistent, abundant and often 1.5 dm. long on old stems.

Ravines, Schenley Park, Allegheny County, J. A. Shafer, (No. 7 type) May and October, 1902, O. E. Jennings, B. H. Smith and C. S. Sargent, (No. 7) September 28, 1905, O. E. Jennings, October 18, 1907, June 10, 1908; common on dry hills in the neighborhood of Pittsburg.

5. *Cratægus præstans* n. sp.

Glabrous. *Leaves* slightly obovate, acute and sometimes pointed at the apex, gradually narrowed to the long slender entire base and finely often doubly serrate above the middle, with straight glandular teeth; more than half grown when the flowers open at the end of May and then thin, dark yellow-green and lustrous above and paler below, and at maturity thin, dark green, 5-6 cm. long and 2-2.5 cm. wide, with thin midribs and primary veins; petioles slender, narrowly wing-margined to below the middle, 2-2.5 cm. in length; leaves on vigorous shoots coarsely serrate, occasionally slightly lobed above the middle, often 7-8 cm. long and 3.5-4 cm. wide. *Flowers* 1.2-1.8 cm. in diameter, on long slender pedicels, in wide lax 12-20-flowered corymbs, the lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, the lobes long, slender, acuminate, entire, reflexed after anthesis; stamens 11-14; anthers light rose pink; styles 2 or 3. *Fruit* ripening late in September, on long slender pedicels, in drooping few-fruited clusters, short-oblong to oval, obtuse at the apex, the rounded base often decurrent on the petiole, dark red, slightly pruinose, marked by minute dark dots; calyx little enlarged, with a short tube, a narrow deep cavity pointed in the bottom, and

reflexed closely appressed lobes; flesh thin, yellow-green, hard, juicy, bitter and acidulous; nutlets, usually 2, acute at the apex, obtuse and rounded at the base, ridged on the back, with a broad slightly grooved ridge, 10–11 mm. long and 5–6 mm. wide.

A tree 4–5 m. high, with a short trunk 1–1.5 dm. in diameter covered with dark scaly bark, small spreading branches forming an open irregular head, and stout only slightly zigzag branchlets dark orange-green and marked by pale lenticels when they first appear, becoming dark chestnut brown to bronze green and lustrous in their first season, and dark gray-brown the following year, and armed with stout straight or slightly curved chestnut brown spines 3.5–4 cm. long.

Nine Mile Run, near Pittsburg, Allegheny County, O. E. Jennings, (No. 78 type) May 27, 1907, O. E. and Grace K. Jennings, September 13, 1909.

### 3. PRUINOSÆ.

Leaves thick, generally broad at the base; petioles long, usually slender; flowers large, in glabrous or hairy corymbs; stamens 5–20; anthers rose color or white. Fruit short-oblong, ovate or obovate, often broader than high, frequently conspicuously angled, green or red, generally pruinose, ripening late; flesh dry and hard, the mature calyx prominent, raised on a short tube; nutlets 3–5. Anthers rose color or pink.

Stamens 20.

Leaves smooth on the upper surface.

Leaves blue-green.

Fruit not mammillate.

Leaves rounded or abruptly cuneate at the base.

Leaves ovate to oblong-ovate; fruit depressed-ovate, conspicuously 5-angled; flesh tinged with red.

1. *C. angulata*.

Leaves oblong-ovate; fruit obovate, not conspicuously angled.....2. *C. viatica*.

Leaves concave-cuneate at the base; fruit subglobose to short-oblong, 5-angled.....3. *C. wilmorensis*.

Fruit mamillate below the middle, conspicuously 5-angled.

4. *C. arcana*.

Leaves yellow-green.

Flowers in 8–12-flowered corymbs; fruit oval to pyriform-oval.....5. *C. crawfordiana*.

Flowers in 4–7-flowered corymbs.

Anthers pink; fruit obovate, deep orange-red.

6. *C. gaudens*.

Anthers dark rose color; fruit short-oblong, green.

7. *C. bellatula*.

Leaves scabrate on the upper surface.



- Leaves yellow-green, oblong-ovate; fruit depressed-globose, not pentagonal.....8. *C. amplifica*.  
 Leaves blue-green, ovate; fruit subglobose to ovoid-globose, pentagonal.....9. *C. denudata*.  
 Stamens 15-20.  
 Leaves smooth.  
 Fruit obovate.  
 Flowers not more than 1.8 cm. in diameter; fruit on long drooping pedicels.....10. *C. leiophylla*.  
 Flowers more than 2 cm. in diameter; fruit on erect or spreading pedicels.....11. *C. dunmorensis*.  
 Fruit subglobose to slightly obovate, on slender drooping pedicels.....12. *C. advena*.  
 Leaves scabrate on the upper surface; fruit short-oblong, on erect or spreading pedicels.....13. *C. torta*.  
 Stamens 10 or less.  
 Mature leaves glabrous.  
 Fruit subglobose.  
 Leaves blue-green.  
 Leaves oblong-ovate; rounded or rarely abruptly cuneate at the base; fruit on short stout pedicels, green flushed with dark red, not pruinose.....14. *C. relictia*.  
 Leaves ovate, concave-cuneate or rarely rounded at the base; fruit on long slender pedicels, purple-red, pruinose.....15. *C. erubescens*.  
 Leaves yellow-green, oblong-ovate, very deeply lobed.  
 16. *C. divisifolia*.  
 Mature leaves more or less scabrate above, broadly ovate, thin, yellow-green; fruit green, becoming red.....17. *C. edurescens*.  
 Anthers pale yellow or white; stamens 20.  
 Mature leaves glabrous.  
 Leaves broad at the base.  
 Leaves rounded or truncate at the base.  
 Leaves thin; flowers less than 2 cm. in diameter; branchlets only slightly zigzag; spines few, short and stout.  
 18. *C. latifrons*.  
 Leaves thick; flowers 2 cm. or more in diameter; branchlets very zigzag; spines numerous, long and slender.  
 19. *C. tribulosa*.  
 Leaves abruptly cuneate or rounded at the base.  
 Fruit subglobose.  
 Leaves ovate to oval, blue-green; fruit not more than 1 cm. in diameter, on slender drooping pedicels.  
 20. *C. incompta*.  
 Leaves broadly ovate, yellow-green; fruit up to 1.3 cm. in diameter, on short stout erect pedicels.  
 21. *C. Shaferi*.  
 Fruit short-oblong to slightly obovate; leaves only 3-4 cm. long; branchlets very slender, contorted.  
 22. *C. bedfordensis*.

- Fruit obovate; leaves more than 5 cm. long, branchlets stouter, not contorted.....23. *C. conjuncta*.  
 Leaves narrowed at the base; fruit subglobose to slightly obovate.....24. *C. duracina*.  
 Mature leaves scabrate; fruit obovate.....25. *C. lecta*.

1. *Crataegus angulata* n. sp.

Glabrous with the exception of a few hairs on the upper surface of the young leaves. *Leaves* ovate to oblong-ovate, acuminate, rounded or abruptly cuneate at the base, finally often doubly serrate, with straight glandular teeth, and slightly divided into 4 or 5 pairs of small acuminate lateral lobes; more than half grown when the flowers open at the end of May and then thin, light yellow-green, slightly hairy above especially along the midribs and veins and rather paler below, and at maturity thin, dark blue-green, smooth and lustrous on the upper surface, pale bluish green on the lower surface, 4.5–6 cm. long and 3.5–4 cm. wide, with thin midribs and primary veins; petioles slender, occasionally glandular, with small mostly deciduous glands, 2–2.5 cm. in length; leaves on vigorous shoots thicker, usually rounded or truncate at the broad base, more coarsely serrate, deeply lobed and often 6–7 cm. long and wide. *Flowers* 2.6 cm. in diameter, on long slender pedicels, in compact mostly 5–8-flowered corymbs, the lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, the lobes gradually narrowed from the base, short, slender, acuminate, finely glandular-serrate near the middle or almost entire, reflexed after anthesis; stamens 18–20; anthers rose color; styles 4 or 5. *Fruit* ripening at the end of October, on slender pedicels, in pendant usually 3–5-fruited clusters, depressed-ovate, conspicuously pentagonal, flattened at the apex, obtusely tapering at the base, light greenish yellow, finally dark purplish red at least on one cheek, marked by large dark dots, pruinose, becoming lustrous, 1–1.2 cm. long and 1.5–1.6 cm. wide; calyx little enlarged, with a very short tube, a wide shallow cavity, and small spreading lobes; flesh firm, dry and mealy, yellow slightly tinged with red, acidulous; nutlets 4 or 5, acute at the ends, rounded and slightly ridged or generally grooved on the back, 7–8 mm. long and 4.5–5 mm. wide.

A shrub 4–5 m. high, with stems sometimes 1 dm. in diameter, covered with dark gray scaly bark, and slender only slightly zigzag branchlets dark orange-green and marked by pale lenticels when they first appear, becoming dark chestnut brown and lustrous in their first season and darker-colored the following year, and armed with stout straight or slightly curved purplish shining spines 2.5–3 cm. long and persistent and becoming compound on old stems and branches.

Nine Mile Run, near Pittsburg, Allegheny County, O. E. Jennings and Grace E. Kinzer, (No. 43 type) October 10, 1905, May 25, 1906, May 28 and October 30, 1907, O. E. Jennings and B. H. Smith, October 5, 1907; Panther Hollow, Schenley Park, Pittsburg, Allegheny County, O. E. and Grace K. Jennings, (No. 69) May 17, 1907, O. E. Jennings and B. H. Smith, October 5, 1907, O. E. Jennings, (No. 71) May 19, 1909; Nine Mile Run, Pittsburg, O. E. Jennings, (No. 41, with a rather more shallow calyx cavity of the fruit) October 7, 1905, May 25, 1906, May 28 and October 5, 1907; Kittanning, Armstrong County, O. E. Jennings, (No. 47) October 14, 1905, May 28, 1906, May 26 and October 7, 1907.

2. *Crataegus viatica* Ashe.

Ann. Carnegie Mus., I, pt. 3, 398 (1902).

Glabrous with the exception of the hairs on the upper surface of the young leaves. *Leaves* oblong-ovate, acuminate, rounded or cuneate at the base, coarsely often doubly serrate, with straight glandular teeth, and sometimes divided into short broad lateral lobes; about one-third grown when the flowers open at the end of May and then very thin, light yellow-green and slightly hairy along the midribs above and pale below, and at maturity thin but firm in texture, dark bluish green, smooth and lustrous on the upper surface, paler on the lower surface, 5-5.5 cm. long and 3.5-4 cm. wide, with prominent midribs and thin primary veins; petioles slender, occasionally glandular, with deciduous glands, 2.5-3 cm. in length; leaves on vigorous shoots thicker, rounded or truncate at the broad base, more coarsely serrate, more deeply lobed, and often 6-7 cm. long and broad, with stout midribs, prominent primary veins and stout winged glandular petioles. *Flowers* 2.5-3 cm. in diameter, on long slender pedicels, in compact usually 5-9-flowered corymbs, the lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, the lobes gradually narrowed from the base, short, slender, acuminate, entire or occasionally dentate near the middle, reflexed after anthesis; stamens 18-20; anthers light rose-pink; styles 4 or 5, surrounded at the base by a narrow ring of pale tomentum. *Fruit* ripening in October, on stout spreading or drooping pedicels, in few-fruited clusters short-pyriform, rounded at the apex, truncate at the base, yellowish green, punctate, pruinose, becoming lustrous, 1.1-1.2 cm. long, 9-10 mm. in diameter; calyx prominent, with a short tube, a broad deep cavity pointed in the bottom, and spreading and reflexed persistent lobes; flesh yellow-green, acid, dry and mealy; nutlets 4 or 5, usually

5, rounded at the apex, sometimes narrowed at the base, slightly ridged on the back, about 5 mm. long and 3-3.5 mm. wide.

A tree 3-4 m. high, with a trunk 1.7-2 dm. in diameter, covered with dark scaly bark, long yellowish green smooth branches wide-spreading below, ascending near the top of the tree, and forming a round-topped head, and stout only slightly zigzag branchlets, dark orange-green when they first appear, becoming dull orange-brown and marked by dull lenticels in their first season and dark red-brown the following year, and armed with numerous stout curved and reflexed purple shining spines 4.5-5 cm. long and occasionally persistent and branched on old stems.

Forbes and Woodlawn Streets, Pittsburg, Allegheny County, O. E. Jennings, (No. 96 type tree = J. A. Shafer, No. 5) June 10 and October 3, 1908, May 9, 1909; Schenley Park, Pittsburg, Allegheny County, O. E. Jennings, (No. 55) May 29, 1907, O. E. Jennings and B. H. Smith, October 5, 1907.

3. *Crataegus wilmorensis* n. sp.

Glabrous with the exception of a few hairs on the young leaves and petioles. *Leaves* ovate to oval, acuminate, concave-cuneate at the often unsymmetrical entire base, sharply often doubly serrate above, with straight glandular 'teeth, and usually slightly divided into 3 or 4 pairs of small acuminate spreading lobes; nearly fully grown when the flowers open at the end of May and then very thin, light yellow-green, lustrous and slightly hairy on the midribs above and pale and glabrous below, and at maturity thin, dark bluish green on the upper surface, light bluish green on the lower surface, 4-5 cm. long and 3-4 cm. wide, with thin midribs and primary veins; petioles slender, sparingly hairy on the upper side while young, soon glabrous, 1.5-2.5 cm. in length. *Flowers* on slender pedicels, in compact mostly 7-9-flowered corymbs, with linear-obovate to linear finely glandular-serrate bracts and bractlets often persistent until the flowers open, the long lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, the lobes long, slender, acuminate, entire or minutely glandular-dentate, reflexed after anthesis; stamens 20; anthers rose-color (in the bud); styles 5. *Fruit* ripening early in October, on short stout spreading pedicels, in few-fruited clusters, subglobose to short-oblong, full and rounded at the ends, green becoming reddish at maturity, about 1.2 cm. in diameter; calyx little enlarged, with a short tube, and reflexed and appressed persistent lobes dark red on the upper side; flesh thin, green and hard; nutlets 5, gradually narrowed and acute or rounded at the ends, often rather broader at the base than at the apex, ridged

on the back, with a broad high deeply grooved ridge, 7–7.5 mm. long and 4–4.5 mm. wide.

A shrub sometimes 4 m. high, with stems 1.5 dm. in diameter, spreading into large thickets, and slender nearly straight branchlets, dark orange-green more or less tinged with red when they first appear, dark chestnut brown, lustrous and marked by dark lenticels in their first season and darker-colored the following year, and armed with slender straight or slightly curved purple shining spines 2–4 cm. long.

Low ground, valley of the Conemaugh River between Portage and Wilmore, Cambria County, B. H. Smith, (275 type) May 21, 1905, B. H. Smith and C. S. Sargent, September 27, 1905.

4. *Cratægus arcana* Beadle.

Bilt. Bot. Studies, I, 122 (1902); Small, Fl. S. E. States, 564; Sargent, Bot. Gazette, XXXV, 101 (The Genus *Cratægus* in Newcastle County, Delaware); Proc. Acad. Nat. Sci. Phila., 1905, 588; Bull. CXXII, N. Y. State Mus., 37.

Dry hillsides, valley of the Little Juniata River below Altoona, Blair County, B. H. Smith, (No. 282) May 22, 1905, B. H. Smith and C. S. Sargent, September 27, 1905, B. H. Smith, May 17, 1906; also western New York to eastern Pennsylvania, Delaware and western North Carolina.

5. *Cratægus crawfordiana* n. sp.

Glabrous. *Leaves* ovate, acuminate, abruptly cuneate or rounded at the base, finely often doubly serrate, with straight glandular teeth, and slightly divided into 4 or 5 pairs of small spreading acuminate lateral lobes; nearly fully grown when the flowers open in the first week of June and then very thin, dark yellow-green above and pale below, and at maturity thin, yellow-green, smooth and lustrous on the upper surface, pale on the lower surface, 4.5–5 cm. long and 3.5–4 cm. wide, with thin prominent midribs and veins; petioles slender, glandular, with minute often persistent glands, 2–2.5 cm. in length. *Flowers* 1.3–1.9 cm. in diameter, on long slender pedicels, in wide lax mostly 8–12-flowered corymbs, the lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, the lobes short, slender, finely glanular-serrate toward the acuminate apex, reflexed after anthesis; stamens usually 20; anthers pink; styles 3 or 4. *Fruit* ripening early in October, on stout pedicels, in few-fruited drooping clusters, oval to pyriform-oval, rounded at the apex, gradually rounded at the base, dark orange-red blotched with yellow-green, marked by large pale dots, somewhat pruinose, 1.2–1.3 cm. long and 1–1.2 cm. in diameter; calyx prominent, with a distinct tube, a deep narrow

cavity pointed and tomentose in the bottom, and small reflexed often deciduous lobes; flesh thin, very light yellow; nutlets 3 or 4, acute at the ends, ridged on the back, with a low narrow ridge, 7–7.5 mm. long and 4.5–5 mm. wide.

A shrub 4–5 m. high, with stems sometimes 1 dm. in diameter and covered with pale gray bark broken into small closely appressed scales, and slender nearly straight branchlets dark orange-green and marked by pale lenticels when they first appear, becoming bright chestnut brown and lustrous in their first season and dark red-brown the following year, and armed with numerous slender nearly straight chestnut brown ultimately dark gray spines 3–4 cm. long and persistent and branched on old stems.

Linesville, Crawford County, O. E. Jennings, (No. 84 type) June 12 and October 9, 1907.

Well distinguished from the other species in this group by its narrow oval or pyriform-oval fruits.

6. *Crataegus gaudens* n. sp.

Glabrous with the exception of the hairs on the young leaves and petioles. *Leaves* ovate to oval, acuminate, acutely or obtusely concave-cuneate at the base, finely doubly serrate, with straight glandular teeth, and divided into 3 or 4 pairs of short broad acute lateral lobes; not more than one-third grown when the flowers open late in May and then thin, dark yellow-green and slightly hairy along the midribs above and paler and sparingly villose on the midribs below, and at maturity thin, dark green and lustrous on the upper surface, pale on the lower surface, 5–6 cm. long and 3.5–4 cm. wide, with thin prominent midribs and primary veins; petioles slender, slightly wing-margined at the apex, sparingly hairy on the upper side while young, soon glabrous, glandular, with minute usually persistent glands, 2.5–3 cm. in length. *Flowers* 2 cm. in diameter; on long slender pedicels, in narrow mostly 6- or 7-flowered corymbs, the lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, the lobes gradually narrowed from the base, short, broad, acuminate, entire, or minutely glandular-dentate above the middle, reflexed after anthesis; stamens 18–20; anthers pink; styles 3–5. *Fruit* ripening the middle of October, on long slender pedicels, in few-fruited clusters, pyriform, truncate or rounded at the apex, gradually narrowed to the long slender base often extending down one side of the pedicel, 5-angled, deep orange-red, marked by large pale dots, pruinose, 1.3–1.6 cm. long and 1.1–1.4 cm. in diameter; calyx little enlarged, with a short tube, a wide deep cavity pointed and tomentose

in the bottom, and small spreading and reflexed lobes; flesh thick, succulent, light yellow tinged with pink, acid; nutlets 3-5, usually 4, narrowed and rounded at the apex, acute at the base, irregularly ridged on the back, with a high narrow grooved ridge, 7-7.5 mm. long, and 4-4.5 mm. wide.

A shrub 4-5 m. high, with stems covered with dark gray bark separating into small closely appressed scales, and stout nearly straight branchlets light orange-green and marked by pale lenticels when they first appear, becoming light chestnut-brown and lustrous in their first season and dark red-brown the following year, and armed with numerous slender straight or slightly curved dark chestnut-brown shining spines 3.5-4.5 cm. long.

Riverview Park, Allegheny County, O. E. Jennings and Grace E. Kinzer, (No. 28 type) October 2, 1905, O. E. Jennings, May 27, 1906, October 12, 1907.

7. *Cratægus bellatula* n. sp.

Glabrous with the exception of occasional hairs on the upper surface of the midribs of young leaves. *Leaves* ovate, acuminate, abruptly cuneate or rounded at the entire base, finely often doubly serrate above, with straight glandular teeth, and slightly divided usually only above the middle into 4 or 5 pairs of small acuminate lobes; more than half-grown when the flowers open about the 20th of May and then very thin, yellow-green above and bluish below, and at maturity thin, smooth and yellow-green on the upper surface, paler on the lower surface, 3.5-4.5 cm. long and 2.5-3 cm. wide, with slender midribs and primary veins; petioles slender, slightly wing-margined at the apex, glandular, with occasional minute persistent glands, 1.5-2.5 cm. in length; leaves on vigorous shoots ovate, rounded, truncate or occasionally cordate at the broad base, coarsely serrate, deeply lobed and often 6-7 cm. long and 5-5.6 cm. wide, with stout broad-winged conspicuously glandular petioles. *Flowers* 2 cm. in diameter, on long slender pedicels, in 4-6-flowered corymbs, the lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, the lobes wide, acuminate, slightly and irregularly glandular-serrate below the middle, reflexed after anthesis; stamens 20; anthers rose color; styles 4 or 5. *Fruit* ripening in October, on elongated slender pedicels, in few-fruited clusters, short-oblong, full and rounded at the ends, green (on September 6th), about 1 cm. in diameter; calyx prominent, with a short tube, a deep narrow cavity, and spreading persistent lobes; flesh thin, green, dry and mealy; nutlets 5, rounded at the ends, ridged on the back, with a low broad grooved ridge, 5-5.6 mm. long and 4.5-5 mm. wide.

A broad round-topped shrub 5-6 m. high, with numerous stout stems covered with dark gray scaly bark, spreading branches, and slender only slightly zigzag branchlets dark orange-green and marked by pale lenticels when they first appear, becoming orange-brown and lustrous in their first season and duller gray-brown the following year, and armed with numerous straight or slightly curved purple shining spines 1.5-2 cm. long.

Rich hillsides, Bedford, Bedford County, B. H. Smith, (No. 18 type) May 20, 1909, B. H. Smith and C. S. Sargent, September 6, 1909.

8. *Crataegus amplifica* n. sp.

*Leaves* oblong-ovate, acuminate, cuneate or rounded at the base, coarsely often doubly serrate, with straight glandular teeth, and deeply divided into 3 or 4 pairs of acuminate spreading lobes; nearly half-grown when the flowers open about the 20th of May and then very thin, dark yellow-green and roughened above by short white hairs and pale and slightly villose in the axils of the veins below, and at maturity thin, dark yellow-green and scabrate on the upper surface, pale bluish green and almost glabrous on the lower surface, 5-6 cm. long and 4-4.5 cm. wide, with thin midribs and primary veins; petioles slender, glandular, with minute stipitate often persistent glands, hairy while young, becoming glabrous, 2.5-3.5 cm. in length; leaves on vigorous shoots thicker and often 7-8 cm. long and broad. *Flowers* 1.6-1.8 cm. in diameter, on long slender glabrous pedicels, in small compact mostly 5-7-flowered corymbs, the long lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, the lobes long, slender, acuminate, coarsely glandular-serrate, glabrous on the outer, sparingly villose on the inner surface, reflexed after anthesis; stamens 18-20; anthers pink; styles 3-5, surrounded at the base by a broad ring of pale tomentum. *Fruit* ripening late in October and persistent after the fall of the leaves, on erect pedicels, in 2-6-fruited clusters, depressed-globose, flattened at the apex, full and rounded at the base, pentagonal, light greenish yellow to dark russet, marked by numerous dark dots, pruinose, becoming lustrous, 1-1.3 cm. in diameter; calyx prominent, with a short tube, a deep narrow cavity pointed in the bottom, and small spreading often deciduous lobes; flesh thin, hard, light yellowish green; nutlets 3-5, gradually narrowed and rounded at the ends, often broader at the apex than at the base, ridged on the back, with a high narrow ridge, 6-6.5 mm. long and 4-4.5 mm. wide.

A shrub 3-4 m. high, with stems sometimes 5 dm. in diameter, covered with dark gray bark separating into long strips, and very slender zigzag glabrous branchlets dark orange-green when they first



appear, becoming light chestnut brown, lustrous, and marked by dark lenticels in their first season and darker colored the following year, and armed with very numerous slender straight purple spines 3-4 cm. long.

Fern Hollow, Pittsburg, Allegheny County, O. E. Jennings, (No. 38 type) October 9, 1905, May 18, 1906.

9. *Crataegus denudata* n. sp.

Glabrous with the exception of the hairs on the young leaves. *Leaves* ovate, acute or acuminate, rounded or abruptly cuneate at the base, sharply often doubly serrate, with straight glandular teeth, and divided usually only above the middle into 4 or 5 pairs of small acuminate lobes; less than half-grown when the flowers open about the 20th of May and then thin, dark yellow-green and furnished above along the midribs and veins with occasional white hairs, and at maturity thin, dark blue-green and scabrate on the upper surface, pale bluish green on the lower surface, 3.5-4.5 cm. long and 3-3.5 cm. wide, with thin midribs and primary veins; petioles slender, wing-margined at the apex, glandular, with minute often persistent glands, 1.5-2.5 cm. in length; leaves on vigorous shoots ovate, more coarsely serrate, more deeply lobed and often 6-7 cm. long and broad. *Flowers* 1-1.3 cm. in diameter, on short slender pedicels, in small compact mostly 5- or 6-flowered corymbs, the lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, the lobes gradually narrowed from wide bases, short, slender, acuminate, entire or occasionally minutely glandular-dentate near the middle, reflexed after anthesis; stamens 18-20; anthers dark rose color; styles 3-5, surrounded at the base by a broad ring of pale hairs. *Fruit* ripening and falling early in October, subglobose to ovoid-globose, full and rounded at the apex, flattened at the base, pentagonal, russet green to dark purplish red, pruinose, becoming lustrous, 1-1.3 cm. in diameter; calyx prominent, with a short tube, a broad deep cavity tomentose in the bottom, and spreading lobes; flesh light yellow-green, thin, juicy, acid; nutlets usually 4, narrowed at the ends, rounded and slightly grooved on the back, 6-6.5 mm. long and about 4 mm. wide.

A shrub 3-4 m. high, with stems 1.5-1.8 cm. in diameter, covered with dark scaly bark, ascending and spreading branches, and slender nearly straight dark chestnut brown lustrous branchlets armed with very slender straight purple shining spines 2.5-3 cm. long and persistent and much-branched on old stems.

Ravines, Schenley Park, Pittsburg, Allegheny County, O. E. and

Grace K. Jennings, (No. 3 type) May 23 and October 18, 1907, O. E. Jennings, October 3, 1908, May 24 and September 13, 1909.

10. *Crataegus leiophylla* Sargent.

Proc. Rochester Acad. Sci., IV, 99 (1903); Bull. CXXII, N. Y. State Mus., 41.

Valley of the Little Juniata River below Altoona, Blair County, B. H. Smith, (No. 269) May 20 and September 25, 1905; also in western New York.

11. *Crataegus dunmorensis* n. sp.

Glabrous with the exception of the hairs on the young leaves and on the calyx-lobes. *Leaves* broadly ovate, acuminate, rounded, truncate or abruptly cuneate at the base, sharply often doubly serrate, with straight glandular teeth, and deeply divided into 3 or 4 pairs of wide acuminate lateral lobes; nearly half-grown when the flowers open in the last week of May and then light yellow-green and roughened above by short white hairs and pale and glabrous below, and at maturity thin, bluish green, smooth and lustrous on the upper surface, paler on the lower surface, 3-4.5 cm. long and 3-4 cm. wide, with slender midribs and primary veins; petioles slender, glandular, with minute often persistent glands, 1.2-1.5 cm. in length; leaves on vigorous shoots truncate or rounded at the base, more coarsely serrate and more deeply lobed and often 6-7 cm. long and broad. *Flowers* 2.2 cm. in diameter, on short slender pedicels, in compact mostly 5-flowered corymbs, with linear-obovate to linear glandular green bracts and bractlets often persistent until the flowers open; calyx-tube broadly obconic, the lobes separated by wide sinuses, short, narrow, acuminate, entire or minutely glandular-serrate near the middle, glabrous on the outer, very sparingly hairy on the inner surface, reflexed after anthesis; stamens 15-20; anthers pale pink or nearly white; styles 3-5. *Fruit* ripening in October, on slender drooping pedicels, in few-fruited clusters, obovate, rather broader than high, green until fully grown, becoming dull red, pruinose, 1.2-1.3 cm. in diameter and 1-1.2 cm. long; calyx prominent, with a short tube, a wide deep cavity, and small spreading and reflexed persistent lobes dark red on the upper side below the middle; flesh thin, green, dry and hard, slightly bitter; nutlets 4 or 5, narrowed and rounded at the apex, acute at the base, rounded and grooved or slightly ridged on the back, 6.5-7 mm. long and 3.5-4 mm. wide.

A shrub 2-3 m. high, with numerous slender stems covered with smooth pale bark, spreading branches, and very slender nearly straight branchlets dark olive-green when they first appear, becoming dull

chestnut brown and marked by small pale lenticels in their first season and dark red-brown the following year, and armed with numerous slender straight or slightly curved purplish shining spines 3-5 cm. long.

Hillside, Dunmore, near Scranton, Lackawanna County, A. Twining, (No. 26 type) May 28 and September 22, 1907.

12. *Cratægus advena* n. sp.

Glabrous with the exception of the hairs on the young leaves and petioles. *Leaves* ovate, acuminate, abruptly concave-cuneate or rounded at the base, sharply often doubly serrate, with straight glandular teeth, and very slightly divided into 3 or 4 pairs of small spreading lobes; nearly half-grown when the flowers open the middle of May and then very thin, light yellow-green, smooth and slightly hairy above along the midribs and paler and glabrous below, and at maturity thin, dark yellow-green, smooth and lustrous on the upper surface, pale on the lower surface, 4.5-5 cm. long and 3.5-4 cm. wide, with thin prominent midribs and primary veins; petioles slender, slightly wing-margined at the apex, glandular, with minute stipitate deciduous glands, slightly villose on the upper side while young, soon becoming glabrous, 2-3 cm. in length. *Flowers* 1.8 cm. in diameter, on long slender pedicels, in rather compact mostly 5-11-flowered corymbs, the elongated lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, the lobes gradually narrowed from the base, long, slender, acuminate, slightly glandular-serrate near the apex, reflexed after anthesis; stamens 15-20; anthers dark pink; styles 3-5, surrounded at the base by a broad ring of pale tomentum; *Fruit* ripening early in October, on long slender red pedicels, in few-fruited clusters, subglobose to slightly obovate, full and rounded at the ends, green when fully grown becoming red at maturity, pruinose, marked by small dark dots, 1.5 cm. in diameter; calyx little enlarged, with a short tube, a deep narrow cavity pointed and tomentose in the bottom, and small spreading lobes; flesh thin, firm and green; nutlets 3-5, gradually narrowed and rounded at the ends, rather broader at the base than at the apex, prominently ridged on the back, with a high broad deeply grooved ridge, 6-8 mm. long and about 6 mm. wide.

A tree 3-4 m. high, with a tall trunk 6-7 cm. in diameter, covered with dark scaly bark, small spreading intricately branched branches forming a wide compact handsome head, and stout nearly straight zigzag branchlets dark orange-green and marked by pale lenticels when they first appear, becoming light chestnut brown and lustrous

in their first season and dull reddish brown the following year, and armed with very numerous stout straight or slightly curved chestnut brown shining spines 4-5 cm. long, and occasionally persistent on old stems.

Rich hillsides; common; Bedford, Bedford County, B. H. Smith and C. S. Sargent, (No. 298 type) September 30, 1905, B. H. Smith, May 18, 1906; border of woods near Bedford Springs, Bedford County, B. H. Smith and C. S. Sargent, (Nos. 9 and 10, with darker rose colored anthers) May 26, 1908, September 7, 1909, B. H. Smith, September 17, 1908, May 22, 1909.

13. *Crataegus torta* n. sp.

Glabrous with the exception of the hairs on the leaves and petioles. *Leaves* ovate, acuminate, cuneate or rounded at the base, finely doubly serrate, with straight glandular teeth, and divided into 4 or 5 pairs of narrow acuminate lateral lobes; more than half-grown when the flowers open from the middle to the end of May, and then thin, dark yellow-green and slightly roughened above by short white hairs, and pale and sparingly villose on the midribs and veins below, and at maturity thin, dark green and scabrate on the upper surface, paler on the lower surface, 4-5 cm. long and 3-4 cm. wide, with thin midribs and primary veins; petioles slender, sparingly hairy on the upper side while young, soon becoming glabrous, glandular, with usually deciduous glands, 2-2.5 cm. in length; leaves on vigorous shoots thicker, usually rounded or truncate at the broad base, more coarsely serrate, more deeply lobed, and often 5-6 cm. long and broad, with stout winged glandular petioles. *Flowers* 2.5 cm. in diameter, on short slender pedicels, in small compact mostly 4-7-flowered corymbs, the elongated lower peduncles from the axils of upper leaves; calyx-tube broadly obconic, the lobes gradually narrowed from the base, short, wide, acuminate, entire or slightly glandular-dentate near the middle, reflexed after anthesis; stamens 16-20; anthers pink; styles 3-5. *Fruit* ripening late in October and persistent until after the leaves have fallen, on slender pedicels, in 4-7-fruited erect or spreading clusters, short-oblong, 5-angled, rounded at the apex, flattened at the base, light yellow or russet green, marked by large dark dots, rather lustrous, 8-10 mm. in diameter; calyx prominent, with a distinct tube, a broad deep cavity pointed in the bottom, and small spreading usually deciduous lobes; flesh thin, hard, yellow-green, acidulous; nutlets 3-5, gradually narrowed and rounded at the ends, slightly ridged or rounded and grooved on the back, 5.5-6 cm. long and 4 mm. wide.

A slender tree 5 or 6 m. high, with a trunk sometimes 8-10 cm

in diameter, and covered with dark gray bark broken into closely appressed scales, and slender zigzag branchlets, dark orange-green and marked by pale lenticels when they first appear, becoming dark chestnut-brown and lustrous in their first season and dark red-brown the following year, and armed with very numerous slender purple shining spines 3.5-4 cm. long.

Borders of woods in rich rocky soil, Nine-mile Run, Pittsburg, Allegheny County, O. E. Jennings, (No. 40 type) October 9, 1905, May 21, 1906, O. E. Jennings and B. H. Smith, October 5, 1907.

14. *Crataegus relieta* n. sp.

Glabrous. *Leaves* oblong-ovate, acuminate, rounded or rarely abruptly cuneate at the wide base, coarsely often doubly serrate, with straight or incurved glandular teeth, and more or less deeply divided into 4 or 5 pairs of short broad acuminate lateral lobes; more than half-grown when the flowers open early in May, and at maturity thin but firm in texture, dark blue-green, smooth and lustrous on the upper surface, pale bluish green on the lower surface, 5-8 cm. long and 4.5-6 cm. wide, with thin yellow midribs and primary veins; petioles slender, occasionally glandular, 2-3 cm. in length. *Flowers* on short stout pedicels, in compact 5-8-flowered corymbs; calyx-tube broadly obconic, the lobes gradually narrowed from wide bases, long, acuminate, entire or occasionally minutely dentate, reflexed after anthesis; stamens 10; styles 3, surrounded at the base by a narrow ring of pale hairs. *Fruit* ripening early in October; on stout erect or spreading pedicels, in few-fruited clusters, subglobose but often rather broader than high, slightly mammillate at the base, green flushed with dull red, 9-10 mm. in diameter; calyx little enlarged, without a tube, with a narrow shallow cavity tomentose in the bottom, and small spreading often deciduous lobes; flesh hard, greenish yellow; nutlets 3-5, broad and rounded at the base, gradually narrowed and rounded at the apex, or when 5 acute at the ends, slightly and irregularly ridged or rounded and grooved on the back, 6-6.5 mm. long and about 4 mm. wide.

A shrub 3-4 m. high, with numerous large spreading stems covered with dark scaly bark and spreading into broad thickets, slender only slightly zigzag branchlets dark chestnut brown, lustrous and marked by pale lenticels in their first season and dull reddish brown the following year, and armed with few slender straight purple spines 2-3.5 cm. long and compound and persistent on old stems.

Rocky knoll, Orbisonia, Huntingdon County, B. H. Smith and

C. S. Sargent, (No. 320 type) October 9, 1906, May 27, 1908, B. H. Smith, October 8, 1907.

The flowers of this species have not been collected.

15. *Crataegus erubescens* n. sp.

Glabrous. *Leaves* ovate, acuminate, concave-cuneate or rarely rounded at the base, coarsely often doubly serrate, with straight glandular teeth, and slightly divided into 4 or 5 pairs of small acuminate lateral lobes; not more than one-third grown when the flowers open late in May and then very thin and light yellow-green, and at maturity thin but firm in texture, dark dull bluish green and smooth on the upper surface, pale on the lower surface, 5-6 cm. long and 4-4.5 cm. wide, with prominent midribs and thin primary veins; petioles stout, glandular, with occasional minute persistent glands, 2-2.5 cm. in length; leaves on vigorous shoots thicker, gradually narrowed and rounded at the broad base, more coarsely serrate and more deeply lobed, and often 6-7 cm. long and 5-6 cm. wide. *Flowers* 1.5 cm. in diameter, on short slender pedicels, in small compact mostly 5-7-flowered corymbs, the lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, the lobes gradually narrowed from broad bases, short, slender, acuminate, entire or minutely dentate near the middle; reflexed after anthesis; petals crenulate; stamens 7-10, generally 10; anthers pale rose-pink; styles 3 or 4. *Fruit* ripening early in October, on long slender drooping pedicels, in usually 1-3-fruited clusters, subglobose but often broader than high, flattened at the ends, pentagonal, purple-red, marked by large pale dots, pruinose, becoming lustrous, 1-1.1 cm. long and 1.2-1.5 cm. wide; calyx little enlarged, without a tube, with a narrow deep cavity pointed in the bottom, and small spreading incurved persistent lobes; flesh thin, hard, dry, light yellow-green, acidulous; nutlets 3-5, broad and rounded at the apex, narrowed at the rounded base, ridged on the back, with a broad low grooved ridge, 6.5-7 mm. long and 4-4.5 mm. wide.

An arborescent shrub 3-4 m. high, with stems sometimes 1.5 cm. in diameter, covered with dark gray bark broken into small closely appressed scales, spreading branches forming a flat-topped head, and stout nearly straight branchlets deeply tinged with red when they first appear, becoming light chestnut brown very lustrous and marked by dark lenticels in their first season, and dull red-brown the following year, and armed with numerous slender nearly straight purple shining spines 3.5-5.5 cm. long.

Hillsides, in rich soil, Kittanning, Armstrong County, O. E. Jennings,

B. H. Smith and C. S. Sargent, (No. 60 type) October 7, 1906, O. E. Jennings, May 27, 1907, O. E. and Grace K. Jennings, October 7, 1907.

16. *Cratægus divisifolia* n. sp.

Glabrous with the exception of the hairs on the lower surface of the young leaves. *Leaves* oblong-ovate, acuminate, abruptly cuneate at the base, coarsely often doubly serrate, with straight glandular teeth, and divided often to the middle into 4 or 5 pairs of narrow acuminate spreading lobes; when they unfold sparingly villose on the midribs and veins below, soon becoming glabrous, less than half-grown when the flowers open about the middle of May and then thin, dark yellow-green above and paler below, and at maturity thin, firm, dark green and rather lustrous on the upper surface, pale on the lower surface, 5-6 cm. long and 4-5 cm. wide, with slender midribs and thin primary veins arching obliquely to the points of the lobes; petioles slender, glandular, with minute occasional persistent glands, 2-2.5 cm. in length; leaves on vigorous shoots thicker, broadly ovate, truncate or rounded at the wide base, coarsely serrate, more deeply lobed and often 7-8 cm. long and wide, with thick midribs and stout glabrous petioles. *Flowers* 1.6-2 cm. in diameter, on long slender pedicels, in small narrow 2-7-flowered corymbs, the lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, the lobes short, nearly triangular, entire or minutely glandular-dentate near the apex, reflexed after anthesis; stamens 9 or 10; anthers pale pink; styles 2-5, usually 4. *Fruit* ripening early in October, on slender drooping pedicels, depressed subglobose but rather broader than high, angled, often mammillate round the middle, slightly tapering to the base, dull red or occasionally blotched with green or russet green, sparingly punctate, pruinose, 1.4-1.7 cm. broad, 1.2-1.5 cm. high; calyx prominent, without a tube, with a wide shallow cup-shaped cavity tomentose in the bottom, and spreading or usually incurved often deciduous lobes; flesh thin, green, dry and hard; nutlets usually 4, narrowed and rounded at the ends, rather broader at the base than at the apex, rounded and only slightly grooved on the back, 7-8 mm. long and 5-5.5 mm. wide.

An arborescent shrub sometimes 2.5 m. high, with stems covered with dark gray bark, numerous flexuose ascending branches forming a round broadly obconic head, and stout nearly straight branchlets dark orange green and marked by pale lenticels when they first appear, becoming light chestnut brown and very lustrous in their first season and dull reddish brown the following year, and armed with numerous

stout slightly curved chestnut brown ultimately dark gray spines 4–5 cm. long.

On rocky knolls, near Kutztown, Bucks County, C. L. Gruber, (No. 22 type) October 6, 1907, May 17 and September 15, 1908.

This handsome species resembles *C. arcana* Beadle in the character of the fruit but the stamens are only 10, not 20, and the deeply divided leaves, which resemble those of *C. pinnatifida* from northern China, are unlike those of any species in this group.

17. *Crataegus edurens* n. sp.

Glabrous with the exception of the hairs on the young leaves. *Leaves* broadly ovate, acute or acuminate, cuneate or rarely rounded at the wide entire base, sharply often doubly serrate above, with glandular teeth, and slightly divided usually only above the middle into 4 or 5 pairs of small acuminate lobes; nearly fully grown when the flowers open from the 15th to the 20th of May and then very thin, light yellow-green and roughened above by short white hairs and pale and glabrous below, and at maturity thin, yellow-green, glabrous, smooth and lustrous on the upper surface, rather lighter-colored on the lower surface, 3.5–4.5 cm. long and often nearly as broad, with thin midribs and primary veins; petioles slender, glandular, with small sometimes persistent glands, 1.5–3 cm. in length; leaves on vigorous shoots thicker, more deeply lobed, rounded at the wide base, sometimes 5.5–6 cm. long and often broader than long. *Flowers* 1.6–1.8 cm. in diameter, on long slender pedicels, in mostly 7- or 8-flowered corymbs, the lower peduncles from the axils of upper leaves; calyx-tube broadly obconic, the lobes gradually narrowed from wide bases, long, acuminate, occasionally furnished above the middle with large glandular teeth, or nearly entire, reflexed after anthesis; stamens 5–10, usually 10; anthers dark rose color; styles 3 or 4, surrounded at the base by a broad ring of pale tomentum. *Fruit* ripening early in October. on long slender spreading pedicels, in few-fruited clusters, obovate, rounded at the apex, slightly narrowed to the base, green, pruinose, becoming red, 8–10 mm. in diameter; calyx prominent, with a short tube, a broad deep cavity wide and tomentose in the bottom, and spreading or reflexed persistent lobes; flesh thin, dry and mealy; nutlets 3 or 4, narrowed and rounded at the apex, broader and rounded at the base, rounded and only slightly ridged on the back, 6.5–7 mm. long and 4–4.5 mm. wide.

A shrub 3–4 m. high, with slender zigzag branchlets light orange green when they first appear, becoming bright chestnut brown, lustrous and marked by pale lenticels in their first season and dull reddish



brown the following year, and armed with very numerous slender straight or slightly curved chestnut brown shining spines 3.5–5 cm. long.

Edges of meadows in Edgmont Township, above Castle Rock, Delaware County, B. H. Smith, (No. 239 type) May 20 and October 6, 1904, May 19, 1909.

18. *Crataegus latifrons* n. sp.

Glabrous with the exception of the hairs on the young leaves. *Leaves* broadly ovate, acuminate, abruptly concave-cuneate or rounded at the wide base, finely often doubly serrate, with straight glandular teeth, and slightly divided above the middle into 3 or 4 pairs of small acuminate spreading lobes; more than half-grown when the flowers open the middle of May and then thin, yellow-green, smooth, lustrous and glabrous above with the exception of a few hairs on the upper side of the midribs near their base, and pale below, and at maturity thin, dark yellow-green and lustrous on the upper surface, pale on the lower surface, 4–5 cm. long and 3.5–5 cm. wide, with thin midribs and primary veins; petioles slender, glandular, with persistent glands, slightly hairy on the upper side while young, soon becoming glabrous, 2–3 cm. in length. *Flowers* 1.6 cm. in diameter, on long slender pedicels, in small compact mostly 4–6-flowered corymbs, the long lower peduncles from the axils of upper leaves; calyx-tube broadly obconic, the lobes gradually narrowed from the base, short, slender, acuminate, entire or minutely dentate, reflexed after anthesis; stamens 18–20; anthers cream color; styles 2–4, surrounded at the base by a narrow ring of pale tomentum. *Fruit* ripening in October, on slender drooping red pedicels, in few-fruited clusters, subglobose to short-oblong, full and rounded at the ends, dark red blotched with green, marked by large dark dots, 1.4–1.5 cm. in diameter; calyx prominent, with a broad shallow cavity, and spreading persistent lobes dark red on the upper side below the middle; nutlets 2–4, broad and rounded at the base, gradually narrowed and acute or rounded at the apex, ridged on the back, with a broad low grooved ridge 6.5–7 mm. long and 4.5–5 mm. wide.

A shrub 5–6 m. high, with stems sometimes 1.5–2 dm. in diameter, stout straight branches, and slender slightly zigzag branchlets dark orange-green tinged with red and marked by numerous pale lenticels when they first appear, becoming light chestnut brown and lustrous in their first season and dull reddish brown the following year, and armed with few stout straight or slightly curved purple shining spines 2.5–3.5 cm. long.

Rocky knoll; Orbisonia, Huntingdon County, B. H. Smith, (Nos. 308 type, 303) May 19, 1906, October 8, 1907, B. H. Smith and C. S. Sargent, (No. 303) October 9, 1906, B. H. Smith, (No. 305) May 19, 1906, October 8, 1907, B. H. Smith and C. S. Sargent, October 7, 1906, B. H. Smith and C. S. Sargent, (No. 305 A) October 9, 1906.

19. *Cratægus tribulosa* n. sp.

Glabrous with the exception of the hairs on the upper surface of the young leaves and on the petioles. *Leaves* broadly ovate, acute or acuminate; rounded or truncate at the wide base, sharply often doubly serrate, with glandular teeth, and divided into 3 or 4 pairs of short broad lateral lobes; about half-grown when the flowers open the middle of May and then thin, yellow-green and slightly hairy on the upper side of the midribs, and pale bluish green below, and at maturity thick, dark yellow-green, smooth and lustrous on the upper surface, paler on the lower surface, 4-5 cm. long and 4-4.5 cm. wide, with thin prominent yellow midribs and primary veins; petioles slender, glandular, with minute often persistent glands, sparingly villose on the upper side while young, becoming glabrous, often rose color in the autumn, 1.5-2.5 cm. in length; leaves on vigorous shoots truncate or slightly cordate at the base, more coarsely serrate and more deeply lobed, and often 5-6 cm. long and wide. *Flowers* 2-2.2 cm. in diameter, on long slender pedicels, in narrow mostly 4- or 5-flowered corymbs, with oblong-obovate to linear acute glandular-serrate green bracts and bractlets often persistent until the flowers open, the elongated lower peduncles from the axils of upper leaves; calyx-tube broadly obconic, the lobes separated by wide sinuses, short, broad, acuminate, entire or occasionally minutely dentate reflexed after anthesis; stamens 20; anthers cream color; styles 4 or 5. *Fruit* ripening at the end of September, on long slender pedicels, in few-fruited clusters, short-oblong to subglobose, often rather broader than high, slightly angled, dull green tinged with red, about 1 cm. in diameter; calyx prominent, with a short tube, a broad shallow cavity wide in the bottom, and spreading and reflexed lobes; flesh thin, green, dry and hard; nutlets 4 or 5, rounded at the ends but narrower at the apex than at the base, rounded and slightly ridged on the back, 5-5.5 mm. long and about 4 mm. wide.

A narrow shrub 3 or 4 m. high, with stems sometimes 4-6 cm. in diameter, covered with dark red scaly bark, small branches, and slender zigzag branchlets, dark orange-green and marked by pale lenticels when they first appear, becoming light chestnut brown and lustrous in their first season and dull red-brown the following year, and armed

with numerous slender straight or slightly curved purple shining spines 4-5 cm. long, persistent and becoming branched on old stems.

Dry oak woods, Bedford Springs, Bedford County, B. H. Smith and C. S. Sargent, (No. 297 type) September 30, 1905, B. H. Smith, May 18, 1906, May 22, 1909.

20. *Cratægus incompta*.

Glabrous. *Leaves* ovate to oval, acute or acuminate, rounded or abruptly cuneate at the broad base, finely often doubly serrate, with straight glandular teeth, and slightly divided usually only above the middle into 3 or 4 pairs of short lobes; nearly half-grown when the flowers open about the 20th of May and then thin, yellow-green, lustrous above and rather paler below, and at maturity thick, dark blue-green on the upper surface, pale bluish green on the lower surface, 4-4.5 cm. long and 3.5-4 cm. wide, with slender midribs and primary veins; petioles stout, slightly wing-margined at the apex, glandular, with minute often persistent glands, 1.8-2.2 cm. in length; leaves on vigorous shoots usually rounded or cordate at the base, more coarsely serrate and more deeply lobed and often 5.5-6 cm. long and nearly as broad. *Flowers* 2-2.3 cm. in diameter, on long slender pedicels, in wide 4-7-flowered corymbs, with oblong-obovate to linear glandular rose-colored bracts and bractlets often persistent until the petals fall, the long lower peduncles from the axils of upper leaves; calyx-tube broadly obconic, the lobes separated by wide sinuses, short, acuminate, entire or irregularly and minutely dentate near the middle, reflexed after anthesis; stamens 20; anthers pale yellow; styles 2 or 3, usually 3. *Fruit* ripening in October, on long slender drooping pedicels, subglobose, or often rather broader than high, dull red, pruinose, marked by large pale dots, about 1 cm. in diameter; calyx prominent, with a short tube, a wide deep cavity broad in the bottom, and elongated reflexed persistent lobes; flesh thin, green, dry and hard; nutlets usually 3, rounded at the ends, rounded and ridged on the back, with a broad deeply grooved ridge, about 5 mm. long and 4 mm. wide.

A slender shrub 1-2 m. high, with thin stems covered with dark scaly bark and spreading into large thickets, and slender zigzag branchlets dark orange-green and marked by pale lenticels when they first appear, becoming dark red-brown in their first season and dull reddish brown the following year, and armed with many stout straight or slightly curved dark chestnut brown shining spines 3.5-5 cm. long, and persistent and very numerous on old stems.

Borders of oak and pine woods on the Maloney Home for the

Aged, Scranton, Lackawanna County, A. Twining, B. H. Smith and C. S. Sargent, (No. 72 type) May 24, 1908, A. Twining, September 19, 1908.

21. *Crataegus shaferi* Ashe.

Ann. Carnegie Mus., I, pt. 3, 397 (1902).

Glabrous. *Leaves* broadly ovate, acute or acuminate, abruptly cuneate or rounded at the broad base, sharply often doubly serrate, with straight glandular teeth, and slightly divided usually only above the middle into 3 or 4 pairs of small acuminate spreading lobes; tinged with red when they first appear, more than half grown when the flowers open from the 15th to the 20th of May and then thin, light yellow-green and lustrous above and paler below, and at maturity thick, dark yellow-green on the upper surface, paler and bluish green on the lower surface, 5-7 cm. long and 4-5.5 cm. wide, with thin mid-ribs and primary veins; petioles slender, 2.5-3.5 cm. in length; leaves on vigorous shoots broadly ovate, acuminate, cordate or occasionally truncate at the base, more coarsely serrate and more deeply lobed, and often 5-6 cm. long and wide. *Flowers* 2.4-2.5 cm. in diameter, on slender pedicels, in mostly 5-7-flowered compact corymbs, with obovate to linear glandular bracts and bractlets fading rose color and often persistent until the flowers open, the lower peduncles from the axils of upper leaves; calyx-tube broadly obconic, the lobes gradually narrowed from broad bases, long, acuminate, entire or occasionally minutely dentate near the middle, reflexed after anthesis; stamens 20; anthers white; styles 4 or 5, surrounded at the base by a narrow ring of white hairs. *Fruit* ripening late in October and often persistent until after the leaves have fallen, on short stout erect or spreading pedicels, in few-fruited clusters, subglobose, sometimes rather broader than high, dull red blotched with green, slightly pruinose, 1.2-1.3 cm. in diameter; calyx much enlarged, with a short tube, a broad deep cavity wide and tomentose in the bottom, and spreading and reflexed persistent lobes; flesh thin, green, dry and mealy; nutlets 4 or 5, narrowed at the ends, broader at the apex than at the base, rounded and slightly grooved on the back, 6.5-7 mm. long and about 4 mm. wide.

A shrub 2-3 m. high, with numerous stems, and slender nearly straight branchlets dark green more or less tinged with red when they first appear, becoming dark chestnut brown, lustrous and marked by pale lenticels in their first season, darker-colored the following year, and armed with numerous slender straight or slightly curved purple shining spines 3-4 cm. in length.

On the Shafer farm in Moor Township, west of Carnot, in Allegheny County, J. A. Shafer, May 20 and October 8, 1901, May 18 and 20 and October 26, 1902.

Mr. Ashe has described the leaves as "at first villose on the petioles and midrib above and veins beneath," but the leaves of Shafer's specimens from which my description has been drawn are entirely glabrous even when they are unfolding.

*Cratægus Shaferi* is near *Cratægus cognata* Sarg., but differs from that species in the broader leaves of the young shoots, in its subglobose not obovate fruit, and by the much larger clayx of the fruit.

22. *Cratægus bedfordensis* n. sp.

Glabrous with the exception of a few hairs on the upper surface of the young leaves. *Leaves* ovate, acute or acuminate, rounded or broadly cuneate at the entire sometimes unsymmetrical base, finely doubly serrate above, with minute straight or incurved glandular teeth, and very slightly divided above the middle into 2 or 3 pairs of small acute spreading lobes; when they unfold slightly tinged with red and sparingly hairy above, with deciduous hairs, nearly half-grown and almost glabrous when the flowers open the middle of May and then thin, light yellow-green, smooth and lustrous above and paler below, and at maturity dark yellow-green and lustrous on the upper surface, dull bluish green on the lower surface, 3-4 cm. long and 2-2.8 cm. wide, with thin yellow midribs and primary veins; petioles slender, glabrous while young, with minute stipitate deciduous glands, 1.5-2 cm. in length; leaves on vigorous shoots broadly ovate, rounded at the wide base, 3.5-4 cm. long and broad. *Flowers* 1.5 cm. in diameter, on long slender pedicels, in 4-8-, usually 5-flowered corymbs, with oblong-obovate to linear glandular-serrate rose-colored bracts and bractlets often persistent until the flowers open, the elongated lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, the lobes gradually narrowed from the base, short, broad, acuminate, entire or occasionally minutely dentate near the middle, reflexed after anthesis; stamens 20; anthers white; styles 3 or 4, surrounded at the base by a narrow ring of pale tomentum. *Fruit* ripening in October, on slender pedicles, in few-fruited drooping clusters, short-oblong to slightly obovate, full and rounded at the ends, green and pruinose when fully grown, turning pale red, marked by small dark dots, 8-10 mm. in diameter; calyx little enlarged, with a short tube, a broad shallow cavity wide in the bottom, and small spreading and reflexed lobes; flesh thin, green and firm; nutlets 3 or 4, gradually narrowed and rounded at the ends, rounded and slightly

grooved or irregularly ridged on the back, 6–6.5 mm. long and about 4 mm. wide.

A shrub 1.5–3 m. high with stems sometimes 10 cm. in diameter, covered with dark scaly bark and spreading freely into large thickets, small, contorted dark branches, and slender rather contorted branchlets light orange-green when they first appear, becoming dark chestnut brown, lustrous and marked by small dark lenticels in their first season and dull reddish brown the following year, and nearly unarmed, or armed with numerous slender straight chestnut brown shining spines 2–4.5 cm. long.

Rich hillsides, Bedford, Bedford County; common; B. H. Smith and C. S. Sargent, (No. 300 type) September 30, 1905, B. H. Smith, May 18, 1906, May 22, 1908; in oak woods, Bedford Springs, Bedford County, (Nos. 293 and 294), B. H. Smith and C. S. Sargent, September 30, 1905, May 18, 1906.

23. *Cratægus conjuncta* Sargent.

Rhodora, V, 57 (1903); Bot. Gazette, XXXV, 379; Bull. CV, N. Y. State Mus., 54.

Keyser Valley, Scranton, Lackawanna County, A. Twining, (No. 15) June 4, 1907, May 23, 1908, (No. 56) October 22, 1907, May 23, 1908; also Illinois to eastern New York and southern New England.

24. *Cratægus duracina* n. sp.

Glabrous with the exception of a few hairs on the upper surface of the young leaves. *Leaves* ovate to rhombic, acuminate, abruptly or gradually narrowed and cuneate at the base, finely often doubly serrate, with straight glandular teeth, and divided usually only above the middle into 3–5 pairs of small acute spreading lobes; not more than one-third grown when the flowers open at the end of May and then dark yellow-green, smooth, lustrous and furnished with occasional hairs along the midribs above and paler below, and at maturity thin and firm, dark yellow-green and lustrous on the upper surface, pale on the lower surface, 4.5–6 cm. long and 3.5–4 cm. wide, with thin prominent midribs and primary veins; petioles slender, slightly wing-margined at the apex, glandular, with minute mostly deciduous glands, 2.5–3.5 cm. in length. *Flowers* about 1.5 cm. in diameter, on short slender pedicels, in small compact mostly 4–7-flowered corymbs, the lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, the lobes gradually narrowed from the base, short, slender, acuminate, entire or minutely glandular-dentate near the middle, reflexed after anthesis; stamens 17–20; anthers cream color; styles 3

or 4, usually 4. *Fruit* ripening in October, on slender elongated pedicels, in drooping few-fruited clusters, subglobose to slightly obovate, rounded at the ends, slightly concave at the base, red blotched with green, pruinose, 8–11 mm. long and 8–10 mm. thick; calyx prominent, with a short tube, a deep wide cavity broad in the bottom, and spreading and reflexed persistent lobes; flesh greenish yellow, hard, dry and subacid; nutlets usually 4, rounded at the ends, rather broader at the base than at the apex, slightly ridged on the back, 6.5–7 mm. long and 4–4.5 mm. wide.

A shrub 1.5–2 m. high, with small ascending stems, and slender nearly straight branchlets dark orange-green and marked by pale lenticels when they first appear, becoming dark chestnut brown and lustrous in their first season and rather darker-colored the following year.

Along the roadside at the mouth of Whisky Hollow across the Allegheny River from Kittanning, Armstrong County, O. E. Jennings. (W. H. type) May 27, 1907, O. E. and Grace K. Jennings, September 28, 1909.

25. *Cratægus lecta* n. sp.

*Leaves* ovate to oval, acuminate, concave-cuneate at the base, coarsely often doubly serrate, with straight glandular teeth, and divided usually only above the middle into 4 or 5 pairs of small acuminate lobes; nearly one-third grown when the flowers open about the middle of May and then thin, dark yellow-green and roughened above by short white hairs and paler and slightly villose, with persistent hairs, along the midribs below, and at maturity thin but firm in texture, dark blue-green and scabrate on the upper surface, pale bluish green on the lower surface, 5–6 cm. long and 3.5–4 cm. wide, with slender prominent midribs and veins; petioles slender, covered while young with matted pale hairs, becoming glabrous, 2–3 cm. in length. *Flowers* 1.5–1.8 cm. in diameter, on short slender villose pedicels, in mostly 5–8 flowered corymbs, the elongated lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, glabrous, the lobes short, slender, acuminate, entire or occasionally minutely dentate near the middle, glabrous, reflexed after anthesis; stamens 18–20; anthers pale yellow; styles 3–5. *Fruit* ripening in October, on short stout drooping or spreading pedicels, in mostly 1–3-fruited clusters, obovate, rounded at the apex, gradually tapering to the obtuse union with the pedicel, sometimes obtusely 4- or 5-angled, light yellow-green, with a dark orange-red cheek, or finally orange-red, 1.3–1.5 cm. long and broad; calyx little enlarged, with a short tube, a

wide shallow cavity tomentose in the bottom, and small spreading and reflexed generally persistent lobes; flesh thin, hard, acid, greenish yellow; nutlets usually 4, broad and rounded at the apex, gradually narrowed to the rounded base, ridged on the back, with a low narrow or broad grooved ridge, 7.5–8 mm. long and 4–4.5 mm. wide.

A shrub 4–5 m. high, with a stem 7–10 cm. in diameter, covered with dark brown bark separating into large loosely attached scales, and stout nearly straight glabrous branchlets dark orange-green and marked by pale lenticels when they first appear, becoming light chestnut brown and very lustrous in their first season and dull gray-brown the following year, and armed with numerous stout straight or slightly curved chestnut brown shining spines 3–4.5 cm. long and compound and very numerous on old stems.

Banks of rocky ravines, between Carnot and Stoop Ferry, Allegheny County, O. E. Jennings, (Nos. 74 type and 75) May 20, 1907, O. E. and Grace K. Jennings and B. H. Smith, October 6, 1907.

#### 4. MEDIOXIMÆ n. gr.

*Leaves* thick, hairy on the upper surface early in the season, glabrous and usually smooth at maturity; petioles long and slender. *Flowers* in few-flowered glabrous corymbs; stamens 10 or less; anthers rose color or rarely pink. *Fruit* subglobose to short-oblong, ovate or obovate, generally longer than broad, rarely slightly angled, scarlet, crimson or orange-red, occasionally slightly pruinose, ripening late in September or in October; flesh hard and solid; mature calyx sessile; nutlets 2–5, usually 3 or 4.

In this group I have placed a number of shrubby species which in some important characters appear intermediate between the Pruinosaë and the Tenuifoliæ. From the former they differ in their thinner leaves, smaller flowers, always glabrous usually few-flowered corymbs, generally fewer stamens with rose-colored or pink anthers, and especially in the fruit; this has a sessile calyx, is rarely slightly pruinose, never green at maturity like that of many of the Pruinosaë and generally ripens earlier. From the Tenuifoliæ the plants of this group differ in their thicker leaves, generally fewer-flowered corymbs, and in their solid not succulent later-ripening fruit. In addition to the species enumerated in this paper, *Cratægus alacris* Sarg. and *Cratægus vittata* Ashe of eastern Pennsylvania may be placed in this group, as well as many of the well-known species of western New York, Ontario and Michigan which have been grouped with the Pruinosaë, like *C. opulens* Sarg., *C. maineana* Sarg., *C. diffusa* Sarg., *C. compta* Sarg., *C. dissona* Sarg., and others.



Fruit subglobose to short-oblong.

Calyx cavity of the fruit deep and narrow.

Leaves broadly ovate to semiorbicular, acute.....1. *C. medioxima*.

Leaves ovate to deltoid, acuminate.....2. *C. felix*.

Calyx cavity of the fruit broad and shallow; leaves ovate-oblong, acuminate.....3. *C. stolonifera*.

Fruit globose to depressed-globose.

Leaves broadly ovate, abruptly cuneate or rounded at the base.

Calyx cavity of the fruit deep and narrow.

Flowers not more than 1 cm. in diameter; fruit obscurely pentagonal, dark red.....4. *C. ambigens*.

Flowers at least 1.5 cm. in diameter; fruit not pentagonal, often broader than high, scarlet.....5. *C. puta*.

Calyx cavity of the fruit broad and shallow; flowers up to 2 cm. in diameter; anthers pink.....6. *C. blairensis*.

Leaves ovate, cuneate at the base, only slightly hairy on the upper surface; fruit flattened at the ends, obscurely angled, often broader than long; calyx cavity broad and shallow.

7. *C. leimonia*.

Leaves ovate to rhombic, cuneate at the base; fruit depressed-globose, crimson, slightly pruinose; calyx cavity broad and shallow.....8. *C. dissona*.

Fruit short-oblong; leaves ovate, more or less scabrate on the upper surface at maturity.....9. *C. ampliata*.

Fruit short-oblong to obovate.

Calyx cavity of the fruit broad and shallow; leaves broadly ovate.

10. *C. pyramidata*.

Calyx cavity of the fruit deep and narrow.

Leaves ovate, glabrous at maturity.....11. *C. impervia*.

Leaves oblong-ovate, scabrate on the upper surface at maturity.

12. *C. luxuriosa*.

Fruit obovate.

Leaves ovate, acuminate.

Calyx cavity of the fruit deep and narrow; fruit slightly 5-angled, orange to greenish orange, becoming scarlet, slightly pruinose.

13. *C. recordabilis*.

Calyx cavity of the fruit broad and shallow.

Calyx-lobes villose on the inner surface.

Flowers in wide lax corymbs; calyx-lobes long and slender.

14. *C. delectata*.

Flowers in narrow compact corymbs; calyx-lobes short and broad.....15. *C. infensa*.

Calyx-lobes glabrous.

Mature leaves scabrate on the upper surface; flowers in 5-10-flowered corymbs; anthers rose color.

16. *C. vegrandis*.

Mature leaves glabrous on the upper surface; flowers in 4-7-flowered corymbs; anthers pale pink.....17. *C. radina*.

Leaves oblong-ovate, blue-green, scabrate on the upper surface;

- fruit dark orange-red, sometimes 3-5-angled, slightly pruinose;  
 calyx cavity deep and narrow.....18. *C. latans*.  
 Leaves broad-ovate, scabrate on the upper surface.  
 Calyx cavity of the fruit deep and narrow.  
 Leaves yellow-green; anthers pale pink; fruit scarlet.  
 19. *C. ruricola*.  
 Leaves blue-green; anthers dark rose color; fruit orange-red.  
 20. *C. effera*.  
 Calyx cavity of the fruit broad and shallow; leaves ovate to oval,  
 blue-green.....21. *C. coerulea*.

1. *Crataegus medioxima* n. sp.

Glabrous with the exception of the hairs on the upper surface of the young leaves. *Leaves* broadly ovate to semi-orbicular, acute, rounded or abruptly cuneate at the wide entire base, finely often doubly serrate above, with straight glandular teeth, and very slightly divided usually only above the middle into 3 or 4 pairs of small acute lobes; nearly fully grown when the flowers open about the 20th of May and then thin, light yellow-green, smooth, lustrous and slightly hairy above especially along the midribs and veins, and at maturity thin, dark yellow-green smooth and glabrous on the upper surface, paler on the lower surface, 4-5 cm. long and 3-3.5 cm. wide, with thin prominent midribs and primary veins; petioles slender, slightly wing-margined at the apex, glandular while young, with mostly deciduous glands, 2-2.5 cm. in length. *Flowers* 1.4-1.6 cm. in diameter, on short slender pedicels, in compact mostly 5-8-flowered corymbs, the long lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, the lobes long, slender, red and acuminate at the apex, entire, reflexed after anthesis; stamens 5 or 6; anthers deep rose-purple; styles 2-5. *Fruit* ripening and falling early in October, on short stout drooping pedicels, in few-fruited clusters, subglobose or rarely short-oblong, somewhat flattened at the ends, slightly pentagonal, dark red marked by numerous large pale dots, 1.1-1.4 cm. in diameter; calyx little enlarged, with a narrow deep cavity pointed in the bottom, and small reflexed closely appressed often deciduous lobes; flesh thick, hard, yellow-green, rather bitter; nutlets 2-5, narrowed and rounded, or when 5, acute at the ends, ridged on the back with a broad low grooved ridge, 7-7.5 mm. long and 4-4.5 mm. wide.

An arborescent shrub 3-4 m. high, with stems sometimes 2.5 cm. in diameter, covered with dark gray scaly bark, large smooth gray branches, and stout nearly straight branchlets dark orange-green more or less tinged with red when they first appear, becoming purple and marked by dark lenticels and somewhat pruinose in their first

season and dark red-brown the following year, and armed with numerous stout slightly curved purple shining spines 4–4.5 cm. long.

Between Carnot and Stoops Ferry, Allegheny County, O. E. Jennings, (No. 73 type) May 20, 1907, O. E. and Grace K. Jennings and B. H. Smith, October 6, 1907.

2. *Cratægus felix* Sargent.

Proc. Acad. Nat. Sci. Phila., 1905, 589.

*Corrected Characters of the Flowers.*—*Leaves* less than one-half grown when the flowers open about the 10th of May and then very thin, yellow-green and roughened above by short white hairs. *Flowers* 1.5–1.9 cm. in diameter, on very short slender glabrous pedicels, in small compact 6–12-flowered corymbs, the lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, the lobes gradually narrowed from wide bases, long, slender, acuminate, minutely glandular-dentate above the middle or entire, slightly hairy on the inner surface, reflexed after anthesis; stamens 5–10; anthers dark rose color; styles 3 or 4, surrounded at the base by a broad ring of pale tomentum.

Through an error caused by the mixing of specimens of two plants growing close together the flowers of *Cratægus felix* were originally described as with 18–20 stamens and pale rose-colored anthers, and this species was placed among the Pruinose.

3. *Cratægus stolonifera* Sargent.

Bot. Gazette, XXXV, 109 (The Genus *Cratægus* in New Castle County, Delaware) (1903); Proc. Acad. Nat. Sci. Phila., 1905, 623; No. IV, Ontario Nat. Sci. Bull., 38.

Valley of the Little Juniata River below Altoona, Blair County, B. H. Smith, (No. 262) May 20, 1905, B. H. Smith and C. S. Sargent, September 27, 1905; also in northern Delaware, eastern Pennsylvania and southern Michigan.

4. *Cratægus ambigens* n. sp.

Glabrous with the exception of the hairs on the upper surface of the young leaves and on the calyx-lobes. *Leaves* broadly ovate, acute or acuminate, abruptly cuneate or rounded at the wide base, finely often doubly serrate, with short straight or incurved glandular teeth, and slightly divided into 3 or 4 pairs of short broad lateral lobes; about one-third grown when the flowers open at the end of May and then thin, yellow-green and slightly roughened above by short white hairs and paler below, and at maturity thick, dark yellow-green, smooth and lustrous on the upper surface, pale bluish green on the lower surface, 3–4 cm. long and 3–3.5 cm. wide, with thin prominent midribs and primary veins; petioles slender, glandular early in the

season, with mostly deciduous glands, 1.5–2 cm. in length; leaves on vigorous shoots subcoriaceous, rounded or truncate at the broad base, coarsely serrate, more deeply lobed and often 5–6 cm. long and wide, with stout midribs, prominent primary veins, reticulate veinlets, and stout conspicuously glandular petioles. *Flowers* 9–10 mm. in diameter, on long slender pedicels, in small compact mostly 7–10-flowered corymbs, the long lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, the lobes short, slender, acuminate, minutely glandular-dentate above the middle, reflexed after anthesis; stamens 8–10, usually 10; anthers rose color; styles 2–4, usually 3. *Fruit* ripening early in October, on short stout drooping pedicels, in usually 1- or 2-fruited clusters, globose to depressed-globose, flattened at the apex, obscurely pentagonal, greenish yellow becoming dark purplish red, marked by numerous pale dots, somewhat pruinose, 1–1.2 cm. in diameter; calyx slightly enlarged, with a deep narrow cavity, and small spreading persistent lobes dark red on the upper side below the middle; flesh firm, greenish yellow, rather juicy and acid; nutlets 2–4, gradually narrowed and rounded at the ends, ridged on the back, with a broad high deeply grooved ridge, 7–7.5 mm. long and 3.5–4 mm. wide.

A shrub 2–3 m. high, with stout stems covered with gray scaly bark, and slender nearly straight branchlets, light orange-green more or less tinged with red when they first appear, becoming bright orange-brown and marked by dark lenticels in their first season and lighter-colored the following year, and armed with numerous stout straight or slightly curved chestnut brown shining spines 1.5–4 cm. long.

Hillsides, Kittanning, Armstrong County, O. E. Jennings, B. H. Smith and C. S. Sargent, (No. 62 type) October 7, 1906, O. E. Jennings, May 27, and June 1, 1907, O. E. and Grace K. Jennings, October 7, 1907.

5. *Cratægus puta* n. sp.

Glabrous with the exception of the hairs on the young leaves and on the calyx-lobes. *Leaves* ovate, acuminate, rounded or abruptly cuneate at the base, finely often doubly serrate, with straight glandular teeth, and slightly divided into 4 or 5 pairs of broad acute lobes; nearly fully grown when the flowers open at the end of May and then thin, light yellow-green and slightly roughened above by short white hairs and pale below, and at maturity thin, yellow-green, smooth and lustrous on the upper surface, paler on the lower surface, 4–5 cm. long and 3.5–4 cm. wide, with slender prominent midribs and thin primary veins; petioles slender, slightly wing-margined at the apex,

glandular, with minute often persistent glands, 2.5–3 cm. in length. *Flowers* 1.5 cm. in diameter, on long slender pedicels, in lax 6–12-flowered corymbs, the elongated lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, the lobes long, slender, acuminate and rose-colored at the apex, minutely glandular-dentate near the middle, sparingly villose on the inner surface, reflexed after anthesis; stamens 5–10; anthers rose color; styles 3–5. *Fruit* ripening early in October, on stout drooping pedicels, in few-fruited clusters, subglobose often broader than long, full and rounded at the ends, scarlet, lustrous, marked by numerous large pale dots, 1–1.2 cm. long and 1–1.4 cm. in diameter; calyx little enlarged, with a deep narrow cavity, and small spreading persistent lobes; flesh yellow, acid; nutlets 3–5, gradually narrowed and rounded at the ends, ridged on the back, with a broad deeply grooved ridge, 6.5–7 cm. long and about 4 mm. wide.

A shrub 5–6 m. high, with stout stems covered with ashy gray bark, small ascending branches forming a wide head, and slender nearly straight branchlets dark orange-green when they first appear, becoming light chestnut brown, lustrous and marked by small dark lenticels in their first season and dull gray-brown the following year, and armed with stout straight or slightly curved chestnut brown shining spines 1.5–2 cm. long, and numerous on the stems and branches.

Lincoln Heights, Scranton, Lackawanna County, A. Twining, (No. 3 type) May 31 and October 5, 1907.

6. *Cratægus blairensis* n. sp.

Glabrous with the exception of the hairs on the upper surface of the young leaves. *Leaves* broadly ovate, acuminate, abruptly cuneate at the wide base, coarsely often doubly serrate, with straight glandular teeth, and slightly divided into 3 or 4 pairs of short broad acuminate lateral lobes; tinged with red and covered on the upper surface with soft white hairs when they unfold, more than half-grown when the flowers open about the 20th of May and then thin, light yellow-green and glabrous above and paler below, and at maturity thick, dark bluish green and lustrous on the upper surface, light yellow-green on the lower surface, 5–6.5 cm. long and 4–4.5 cm. wide, with thin mid-ribs and primary veins; petioles slender, glandular, with minute mostly deciduous glands, 2.5–4 cm. in length; leaves on vigorous shoots often rounded at the base, more coarsely serrate, more deeply lobed and 7–8 cm. long and 6–7 cm. wide, with stouter conspicuously glandular petioles and foliaceous lunate glandular-serrate

deciduous stipules. *Flowers* 1.8–2 cm. in diameter, on long slender pedicels, in small compact mostly 5–7-flowered corymbs, the elongated lower peduncles from the axils of upper leaves; calyx-tube broadly obconic, the lobes separated by wide sinuses, gradually narrowed from the base, short broad, acuminate, irregularly glandular-serrate below the middle, reflexed after anthesis; stamens 10; anthers pale pink; styles 3–5, surrounded at the base by a broad ring of pale tomentum. *Fruit* ripening in October, on stout spreading pedicels, in few-fruited clusters, subglobose rather broader than long and flattened at the ends to slightly obovate, dull red, pruinose, marked by dark dots, 1–1.2 cm. in diameter; flesh green, dry and hard; calyx little enlarged, without a tube, with a wide shallow cavity, and small reflexed closely appressed lobes; nutlets 3–5, gradually narrowed and rounded at the ends, rather broader at the base than at the apex, ridged on the back, with a broad high grooved ridge, 7.5–8 mm. long and 5.5–6 mm. wide.

A tree sometimes 10 m. high, with a trunk 3 dm. in diameter, covered with dark scaly bark, large ascending branches, and stout slightly zigzag branchlets light orange-green and marked by pale lenticels when they first appear, becoming dark chestnut or orange-brown and lustrous in their first season and dull gray-brown the following year, and armed with numerous slender straight or slightly curved purple shining spines 3.5–4 cm. long.

Rich bottom-lands of the Little Juniata River, near Elizabeth Furnace, East Altoona, Blair County, B. H. Smith, (Nos. 281 type and 266) May 22, 1905, B. H. Smith and C. S. Sargent, September 27, 1905, (No. 258) B. H. Smith, May 20, 1905, B. H. Smith and C. S. Sargent, September 27, 1905.

7. *Cratægus leimonia* n. sp.

*Leaves* ovate, acuminate, abruptly or gradually narrowed and cuneate at the base, finely often doubly serrate, with straight glandular teeth, and slightly divided into 4 or 5 pairs of small acute spreading lateral lobes; about half-grown when the flowers open at the end of May and then thin, yellow-green and slightly hairy along the midribs above, paler below, and at maturity thin, light yellow-green and lustrous on the upper surface, pale yellow-green on the lower surface, 3.5–4.5 cm. long and 3–3.5 cm. wide, with thin midribs and primary veins; petioles slender, slightly wing-margined at the apex, glandular, with minute occasionally persistent glands, 2–2.5 cm. in length. *Flowers* not more than 1.5 cm. in diameter, on long slender pedicels, in small compact mostly 5–7-flowered corymbs, the lower peduncles

from the axils of upper leaves; calyx-tube narrowly obconic, the lobes long, slender, acuminate, coarsely glandular-serrate near the middle or entire, reflexed after anthesis; stamens 10; anthers rose color; styles 2-4, usually 3. *Fruit* ripening in October. on long slender drooping pedicels, in few-fruited clusters, subglobose, flattened at the ends, concave at the insertion of the pedicel, more or less obtusely 5-angled, orange-red blotched with yellow-green, marked by large pale dots, slightly pruinose, 1-1.5 cm. broad and 1-1.3 cm. long; calyx little enlarged, with a wide shallow cavity, and spreading and appressed lobes; flesh thin, light greenish yellow, slightly juicy; nutlets usually 3, broad and rounded at the base, narrowed at the apex, ridged on the back, with a broad prominent sometimes grooved ridge, 6-7 mm. long and 5-5.7 mm. wide, or when 2 nearly hemispherical in general outline.

A shrub 2-3 m. high with slender nearly straight branchlets dark orange-green and marked by pale lenticels when they first appear, becoming dark chestnut red and lustrous during their first season and dull red-brown the following year, and armed with numerous slender straight chestnut brown spines 3-4 cm. long.

In rich alluvial soil near Kittanning, Armstrong County, O. E. Jennings, (No. 65 type) May 27, 1907, O. E. and Grace K. Jennings, September 27, 1909.

8. *Cratægus dissona* Sargent.

Rhodora, V, 60 (1903); Bot. Gazette, XXXV, 379; Proc. Acad. Nat. Sci. Phila., 1905, 601.

On an alluvial flat, West Kittanning, Armstrong County, O. E. Jennings, B. H. Smith and C. S. Sargent, (No. 64) October 7, 1906, O. E. Jennings, May 27, 1907; also Illinois to western and southern New England and to eastern Pennsylvania.

9. *Cratægus ampliata* n. sp.

Glabrous with the exception of the hairs on the upper surface of the young leaves. *Leaves* ovate, acuminate, rounded or cuneate at the broad base, finely often doubly serrate, with straight glandular teeth, and deeply divided into 4 or 5 pairs of broad acuminate lateral lobes; nearly fully grown when the flowers open about the middle of May and then thin, dark blue-green, lustrous and roughened above by short white hairs and pale below, and at maturity thin but firm in texture, scabrate or nearly smooth on the upper surface, 4.5-5.5 cm. long and 3.5-5 cm. wide, with slender midribs and primary veins; petioles slender, slightly wing-margined at the apex, glandular with minute deciduous glands, 2-2.5 cm. in length; leaves on vigorous

shoots thicker, cordate or truncate at the base, more coarsely serrate more deeply lobed, and sometimes 6-6.5 cm. long and broad, with stout glandular petioles. *Flowers* 1.2-1.4 cm. in diameter, on long stout pedicels, in small 5- or 6-flowered corymbs, the elongated lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, the lobes gradually narrowed from wide bases, long, slender, acuminate, entire or minutely glandular-dentate near the middle, reflexed after anthesis; stamens 10; anthers rose color; styles 3-5. *Fruit* ripening early in October, on stout pedicels, in few-fruited clusters, short-oblong, full and rounded at the ends, dull scarlet, 1.2 cm. long and nearly as broad; flesh thin and yellow; nutlets 3-5, rounded at the base, gradually narrowed and rounded at the apex, or when 5 acute at the ends, ridged on the back, with a high narrow slightly grooved ridge, about 6 mm. long and 4 mm. wide.

A shrub 3-4 m. high, with small stems covered with ashy gray bark, small spreading branches forming a round-topped head, and slender only slightly zigzag branchlets dark orange-brown and marked by pale lenticels when they first appear, becoming light chestnut brown and lustrous in their first season and dull gray-brown the following year, and armed with stout slightly curved chestnut brown shining spines 3-3.5 cm. long.

Rocky knoll, Orbisonia, Huntingdon County, B. H. Smith, (No. 312 type) May 20, 1906, October 8, 1907.

10. *Cratægus pyramidata* n. sp.

Glabrous with the exception of the hairs on the young leaves and calyx-lobes. *Leaves* broadly ovate, acuminate and frequently long-pointed at the apex, rounded or abruptly cuneate at the broad entire base, coarsely often doubly serrate above, with straight glandular teeth, and slightly divided usually only above the middle into 3 or 4 pairs of short broad lobes; more than half grown when the flowers open about the 20th of May and then thin, yellow-green and roughened above by short white hairs and pale blue-green below, and at maturity thin but firm in texture, dark yellow-green, nearly smooth and lustrous on the upper surface, pale blue-green on the lower surface, 5-6 cm. long and 4.5-5 cm. wide, with thin prominent midribs and slender conspicuous primary veins; petioles slender, slightly wing-margined at the apex, glandular, with conspicuous persistent glands, 2.5-3 cm. in length; leaves on vigorous shoots cuneate, rounded or slightly cordate at the base, coarsely serrate, more deeply lobed and often 7-8 cm long and 6-7 cm. wide, with stouter broadly winged more glandular petioles. *Flowers* 2 cm. in diameter, on long slender



pedicels, in wide 5- to 10-flowered corymbs, the much elongated lower pedicels from the axils of upper leaves; calyx-tube narrowly obconic, the lobes long, slender, acuminate, entire or occasionally slightly dentate above the middle, sparingly hairy on the inner surface, reflexed after anthesis; stamens 10; anthers dark rose color; styles 3 or 4, surrounded at the base by a broad ring of long white hairs. *Fruit* ripening late in September or early in October. on stout pedicels in few-fruited spreading clusters, short-oblong or slightly obovate, rounded at the ends, scarlet, lustrous, marked by large pale dots, 1.1–1.3 cm. long and 1–1.1 cm. wide; calyx little enlarged, with a wide shallow cavity, and spreading and appressed entire or dentate lobes dark red on the upper side below the middle; flesh thick, yellow, soft and succulent; nutlets 3 or 4, broad and rounded at the apex, narrowed to the rounded base, ridged on the back, with a broad low slightly grooved ridge, 7–8 mm. long and 4–4.5 mm. wide, with a conspicuous hypostyle often extending to below the middle of the nutlet.

A shrub 7–8 m. high, with several stems, numerous erect branches forming a narrow pyramidal head, and stout zigzag branchlets dark orange-green more or less tinged with red and marked by large pale lenticels when they first appear, becoming in their second season light chestnut brown and very lustrous, and dull gray-brown the following year, and armed with occasional stout slightly curved spines 2.5–3 cm. long or often unarmed.

Glades and borders of oak woods near the Maloney Home and Country Club, Scranton, Lackawanna County, A. Twining, B. H. Smith and C. S. Sargent, (No. 73 type) May 24, 1908, A. Twining, September 19 and October 10, 1909; (No. 74) A. Twining, September 29, 1908.

This handsome species is very distinct in its remarkable fastigiate habit.

11. *Cratægus impervia* n. sp.

Glabrous with the exception of the hairs on the upper surface of the young leaves. *Leaves* ovate, acuminate and often long-pointed at the apex, broad and rounded or abruptly cuneate at the base, sharply doubly serrate, with straight glandular teeth, and divided into 5 or 6 pairs of small acuminate spreading lateral lobes; about one-third grown when the flowers open in the last week of May and then yellow-green, lustrous and roughened above by short soft white hairs and pale below, and at maturity thin, dark yellow-green, smooth, and lustrous on the upper surface, pale on the lower surface, 4.5–6 cm. long and 4.5–5 cm. wide, with stout midribs, and thin primary veins arching

obliquely to the points of the lobes; petioles slender, slightly wing-margined at the apex, glandular, with minute often persistent glands, 1.5–2 cm. in length; leaves on vigorous shoots thicker and usually rounded at the base. *Flowers* 1.5–1.6 cm. in diameter, on long stout pedicels, in rather compact 6–15-flowered corymbs, the long lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, the lobes gradually narrowed from the base, long, slender, acuminate, entire or occasionally minutely dentate above the middle, reflexed after anthesis; stamens 5–10; anthers light rose color; styles 2 or 3. *Fruit* ripening the end of September, on stout reddish drooping pedicels, in few-fruited clusters, short-oblong to slightly obovate, full and rounded at the ends, salmon-red, lustrous, marked by small pale dots, 1.2–1.5 cm. long and 1–1.2 cm. in diameter; calyx little enlarged, with a deep narrow cavity pointed in the bottom, and small spreading persistent lobes dark red on the upper side below the middle; flesh thick, yellow, dry and bitter, nutlets 2 or 3, narrowed at the ends, acute at the apex, rounded at the base, irregularly ridged on the back, with a broad low slightly grooved ridge, 7–8 mm. long and 4–4.5 mm. wide.

A shrub 3–5 m. high, with small greenish gray smooth stems spreading into thickets, and slender only slightly zigzag branchlets dark orange-green when they first appear, becoming light chestnut brown, lustrous and marked by numerous pale lenticels when they first appear, dull reddish brown the following year, and armed with many slender slightly curved chestnut brown shining spines often pointed toward the base of the branch and 1.8–3.5 cm. long.

Hillsides, Dunmore, near Scranton, Lackawanna County, A. Twining, (No. 25 type) May 28 and September 22, 1907.

12. *Crataegus luxuriosa* n. sp.

Glabrous with the exception of the hairs on the upper surface of the young leaves and on the calyx-lobes. *Leaves* oblong-ovate, acuminate, gradually narrowed and cuneate or rounded at the often unsymmetrical base, finely often doubly serrate, with straight glandular teeth, and slightly divided usually only above the middle into 3 or 4 pairs of small acute lobes; about half-grown when the flowers open late in May and then thin, dark yellow-green and roughened above by short white hairs and paler below, and at maturity thin, dark yellow green and scabrate on the upper surface, pale bluish green on the lower surface, 6–7 cm. long and 4.5–5.5 cm. wide, with slender midribs and thin obscure primary veins; petioles slender, slightly wing-margined at the apex, occasionally glandular, with minute persistent

glands, 2.5–3.5 cm. in length. *Flowers* 1.5–1.9 cm. in diameter, on short slender pedicels, in compact mostly 6–12-flowered corymbs, the lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, the lobes long, slender, acuminate, entire or occasionally slightly dentate near the middle, glabrous on the outer surface, very slightly villose on the inner surface, reflexed after anthesis; stamens 8–10; anthers bright purple-pink; styles 3–5. *Fruit* ripening and beginning to fall early in October, on short stout pedicels, in drooping usually 1–3-fruited clusters, subglobose to slightly obovate, scarlet, lustrous, marked by pale dots, 1.2–1.8 cm. in diameter; calyx little enlarged, with a deep narrow cavity pointed in the bottom, and spreading and incurved usually persistent lobes dark red on the upper side below the middle; flesh thick, yellow-green and acid; nutlets 3–5, usually 4, gradually narrowed and rounded at the ends, ridged on the back, with a high broad grooved ridge, 7–7.5 mm. long and 4.5–5 mm. wide.

An oval-headed tree 6–7 m. high, with a short trunk sometimes 2.5 dm. in diameter, covered with dark gray scaly bark, and stout zigzag often contorted branchlets dark orange-green and marked by large pale lenticels when they first appear, becoming light chestnut brown and lustrous in their first season and dull reddish brown the following year, and armed with few stout slightly curved chestnut brown shining spines 2–3.5 cm. long and persistent and becoming branched on old stems.

Rich hillsides, Kittanning, Armstrong County, O. E. Jennings, B. H. Smith and C. S. Sargent, (No. 59 type) October 7, 1906, O. E. Jennings, May 27, 1907, O. E. and Grace K. Jennings, October 7, 1907; flood plain of the Allegheny River in sandy soil at Whiskey Hollow, opposite Kittanning, Armstrong County, O. E. Jennings, B. H. Smith and C. S. Sargent, (No. 64) October 7, 1906, O. E. Jennings, May 27, 1907; Linesville, Cooper County, O. E. Jennings, (No. 82, with deep rose-purple anthers), June 12 and October 9, 1907.

13. *Cratægus recordabilis* n. sp.

Glabrous with the exception of the hairs on the upper surface of the young leaves. *Leaves* ovate, acuminate, gradually narrowed and usually rounded, or cuneate at the entire base, finely often doubly serrate above, with straight glandular teeth, and divided generally only above the middle into 4 or 5 pairs of small acuminate spreading lobes; more than half grown when the flowers open late in May and then thin, dark yellow-green, smooth, lustrous, and slightly hairy on the mid-ribs above and pale below, and at maturity thin, dark yellow-green and

very lustrous on the upper surface, pale on the lower surface, 4.5–5.5 cm. long and 3.5–4 cm. wide, with thin midribs and primary veins; petioles slender, slightly wing-margined at the apex, 2.5–3 cm. in length; leaves on vigorous shoots truncate or rounded at the broad base, more coarsely serrate and more deeply lobed, and often 5–6 cm. long and broad. *Flowers* 1.5 cm. in diameter, on short slender pedicels, in lax mostly 5–12-flowered corymbs, the long lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, the lobes gradually narrowed from the base, long, narrow, acuminate, entire or minutely dentate above the middle; stamens 8–10; usually 10; anthers dark rose color; styles 3 or 4, usually 4. *Fruit* ripening early in October, on slender drooping pedicels, in few-fruited clusters, narrow-obovate, full and rounded at the apex, gradually contracted to the rounded base, deeply convex at the insertion of the pedicel, slightly 5-angled, orange to greenish orange, becoming scarlet at maturity, marked by large pale dots, pruinose 1.2–1.3 cm. long and 9–10 mm. in diameter; calyx little enlarged, with a deep narrow cavity pointed in the bottom, and small spreading and reflexed persistent lobes dark red on the upper side below the middle; flesh thin, light orange color, juicy, acidulous; nutlets usually 4, narrowed and rounded at the ends, broader at the apex than at the base, ridged on the back, with a low narrow ridge, 6–6.5 mm. long and 3.5–4 mm. wide.

A bushy tree 3 or 4 m. high, with a short trunk sometimes 1.2 dm. in diameter and covered with flaky bark, small ascending gray-green branches forming a round-topped head, and slender zigzag branchlets dark chestnut brown when they first appear, becoming very lustrous and marked by dark lenticels in their first season and dull red-brown the following year, and armed with stout nearly straight chestnut-brown shining spines 1.5–3.5 cm. long, persistent and becoming branched on old stems.

Hillsides, in rich soil, Kittanning, Armstrong County, O. E. Jennings, (No. 46 type) October 14, 1905, O. E. Jennings, B. H. Smith and C. S. Sargent, October 7, 1906, O. E. Jennings, May 27, 1907, O. E. and Grace K. Jennings, October 7, 1907.

14. *Cratægus delectata* n. sp.

Glabrous with the exception of the hairs on the young leaves and on the calyx-lobes. *Leaves* ovate, acuminate and long-pointed, abruptly cuneate or rounded at the base, sharply often doubly serrate, with long slender glandular teeth, and slightly divided usually only above the middle into 4 or 5 pairs of broad acuminate spreading lobes; more than half-grown when the flowers open about the 20th of May and then

light yellow-green and roughened above by short white hairs and pale and glabrous below, and at maturity thin, dark yellow-green, smooth and lustrous on the upper surface, pale bluish green on the lower surface, 4–5 cm. long and 3–3.5 cm. wide, with thin very prominent midribs and primary veins; petioles slender, slightly wing-margined at the apex, 1.5–2 cm. in length; leaves on vigorous shoots usually rounded or sometimes cuneate at the base, more coarsely serrate, more deeply lobed and often 6–7 cm. long and 5–6 cm. wide, with stout petioles broad-winged nearly to the middle and often glandular with persistent glands. *Flowers* 1.5 cm. in diameter, on long slender pedicels, in wide lax mostly 7–12-flowered corymbs, the much elongated lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, the lobes gradually narrowed from wide bases, long, slender, acuminate, minutely glandular-serrate, slightly villose on the inner surface, reflexed after anthesis; stamens 6–10; anthers light rose color; styles 3 or 4. *Fruit* ripening the end of September, on slender reddish pedicels, in few-fruited clusters, obovate, full and rounded at the apex, gradually narrowed to the base, crimson, lustrous, marked by small pale dots, 1.2–1.5 cm. long and about 1 cm. in diameter; calyx little enlarged, with a wide shallow cavity, and small closely appressed lobes dark red on the upper side below the middle; flesh thin, yellow, soft and succulent; nutlets 3 or 4, gradually narrowed and acute at the ends but rather broader at the base than at the apex, ridged on the back, with a low grooved ridge, 6–7 mm. long and about 3 mm. wide.

A broad shrub sometimes 6 m. high, with numerous stems often 1 dm. in diameter and covered with scaly bark, spreading branches, and slender slightly zigzag branchlets light chestnut brown, lustrous and marked by numerous dark lenticels in their first season and still lustrous in the second year, and armed with slender slightly curved chestnut brown shining spines 4.5–5 cm. long, and persistent on the stems.

Keyser Valley, near Scranton, Lackawanna County, A Twining, (No. 54 type) September 30, 1907, May 23 and September 23, 1908.

15. *Cratægus infensa* n. sp.

Glabrous with the exception of the hairs on the young leaves and calyx-lobes. *Leaves* ovate, acuminate, abruptly concave-cuneate or rounded at the base, sharply often doubly serrate, with straight glandular teeth, and slightly divided into 4 or 5 pairs of small acuminate lateral lobes; nearly half grown when the flowers open about the middle of May and then thick, dark yellow-green and slightly hairy

on the midribs above and pale below, and at maturity thin, dark yellow-green, smooth and lustrous on the upper surface, pale on the lower surface, 3.5–4 cm. long and 3–3.5 cm. wide, with thin midribs and primary veins; petioles slender, occasionally glandular, with minute sometimes persistent glands, 1.5–2.5 cm. in length; leaves on vigorous shoots cordate or truncate at the broad base, more coarsely serrate, more deeply lobed, often 5–6 cm. long and broad, with stout midribs, prominent primary veins, and stout winged conspicuously glandular petioles. *Flowers* 1.6–1.8 cm. in diameter, on long slender pedicels, in compact mostly 6–12-flowered corymbs, the elongated lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, the lobes short, broad, acuminate, minutely glandular-dentate near the middle, glabrous on the outer surface, slightly villose on the inner surface, reflexed after anthesis; petals often tinged with pink; stamens 10; filaments pink; anthers purplish pink; styles 3 or 4, usually 4. *Fruit* ripening in October, on short red drooping pedicels, in few-fruited clusters, short-obovate, nearly truncate at the apex, gradually narrowed, long and rounded at the base, scarlet, marked by large pale dots, slightly pruinose, 9–12 mm. long and 1.2–1.6 mm. wide; calyx little enlarged, with a short tube, a wide shallow cavity tomentose in the bottom, and small spreading usually deciduous lobes; flesh thin, yellow-green, and succulent; nutlets usually 4, gradually narrowed and rounded at the ends, ridged on the back, with a broad high grooved ridge, 6–6.5 mm. long and about 4.5 mm. wide.

A small tree 4 m. high, with a trunk 1.5–2 dm. in diameter, covered with gray scaly bark, wide-spreading branches forming a broad flat-topped head, and stout nearly straight branchlets dark orange-green sometimes tinged with red and marked by large pale lenticels when they first appear, becoming dark chestnut brown or purple and lustrous in their first season and dull red-brown the following year, and armed with numerous very stout straight purple shining spines 3–4.5 cm. long and persistent and much-branched on old stems.

Charleroi, Washington County, O. E. Jennings and Grace E. Kinzer, (No. 35) October 7, 1905, O. E. Jennings, May 21, 1906, May 21 and October 14, 1907.

16. *Crataegus vegrandia* n. sp.

Glabrous with the exception of the hairs on the upper surface of the young leaves. *Leaves* ovate, acuminate, abruptly cuneate or rounded at the entire base, finely often doubly serrate above, with straight or incurved glandular teeth, and slightly divided into 3 or 4 pairs of narrow acuminate lobes; more than half-grown when the

flowers open in the last week of May and then slightly tinged with red, very thin, yellow-green and roughened above by short white hairs and pale below, and at maturity thin but firm in texture, dark yellow-green and scabrate on the upper surface, pale bluish green on the lower surface, 3.5–4.5 cm. long and 2.5–3.5 cm. wide, with thin prominent yellow midribs and veins; petioles slender, slightly wing-margined at the apex, 2.5–3 cm. in length; leaves on vigorous shoots thicker, usually rounded at the broad base, frequently abruptly pointed at the apex, more coarsely serrate and more deeply lobed, and often 5–6 cm. long and wide. *Flowers* 1.5 cm. in diameter, on long slender pedicels, in crowded 5–15-flowered corymbs, with oblong-obovate to linear glandular bracts and bractlets fading brown and often persistent until after the flowers open, the elongated lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, the lobes separated by wide sinuses, gradually narrowed from the base, long, slender, acuminate, finely glandular-serrate near the middle, reflexed after anthesis; stamens 5–10; anthers rose color; styles 3 or 4, surrounded at the base by a narrow ring of pale tomentum. *Fruit* ripening about the 20th of September, on slender drooping red pedicels, in few-fruited clusters, obovate, rounded at the apex, gradually narrowed from above the middle to the base, scarlet, lustrous, marked by large pale dots, 9–10 mm. long and 7–9 mm. in diameter; calyx little enlarged, with a broad shallow cavity, and small spreading and appressed lobes dark red on the upper side below the middle; flesh thin, yellow, soft and juicy; nutlets 3 or 4, gradually narrowed and rounded at the ends, sometimes broader at the base than at the apex, ridged on the back, with a broad low grooved ridge, 6–6.5 mm. long and 4–4.5 mm. wide.

A shrub 3–4 m. high, with small erect stems and branches covered with yellow-green bark, and slender slightly zigzag branchlets dark orange-green when they first appear, becoming bright chestnut brown, lustrous and marked by small pale lenticels in their first season and dull red-brown the following year, and armed with numerous slender slightly curved chestnut brown shining ultimately dark gray spines 3.5–4.5 cm. long, persistent and becoming branched on old stems.

Border of woods, Maloney Home, near Scranton, Lackawanna County, A. Twining, (No. 31 type) May 28 and September 23, 1907.

17. *Cratægus radina* n. sp.

Glabrous with the exception of the hairs on the upper surface of the young leaves. *Leaves* ovate to broad-obovate, acuminate and long-pointed at the apex, gradually or abruptly cuneate at the entire

base, sharply often doubly serrate above, with straight glandular teeth, and slightly divided often only above the middle into 4 or 5 pairs of narrow acuminate lobes; very thin, dark yellow-green and furnished with occasional hairs on the upper side of the midribs and paler below when the flowers open about the middle of May; petioles slender, wing-margined at the apex, sparingly glandular, 2-3 cm. in length; mature leaves not seen. *Flowers* 1.5-1.8 cm. in diameter, on long slender pedicels, in small compact mostly 4-7-flowered corymbs, the long lower peduncles from the axils of small narrow acuminate deciduous leaves; calyx-tube narrowly obconic, the lobes long, slender, acuminate, finely glandular-serrate, reflexed after anthesis; stamens 8-10, usually 10; anthers pale pink; styles 3-5, *Fruit* ripening and falling early in October, on short slender pedicels, in few-fruited clusters, globose to slightly obovate, rounded at the apex, 5-angled, yellow-green to dark purplish red, marked by small dark dots, pruinose, becoming lustrous, 1.2-1.4 cm. in diameter; calyx little enlarged, with a broad shallow cavity, and spreading lobes; flesh pale greenish yellow, solid, juicy, acidulous; nutlets 3-5, narrowed and rounded at the ends, broader at the base than at the apex, slightly ridged on the back, 6-6.5 mm. long and 3.5-4 mm. wide.

A tree 3-4 m. high, with a trunk sometimes 1 dm. in diameter and covered with dark gray scaly bark, ascending and spreading branches forming a round-topped head, and slender nearly straight branchlets, dark green and marked by pale lenticels when they first appear, becoming light chestnut brown and lustrous in their first season and dull reddish brown the following year, and armed with numerous very slender slightly curved chestnut brown shining spines 1.5-3.5 cm. long and persistent and much-branched on old stems.

Ravines, Schenley Park, O. E. Jennings, B. H. Smith and C. S. Sargent, (No. 4 type) September 28, 1905, O. E. and Grace K. Jennings, May 20 and October 18, 1907, O. E. Jennings, October 3, 1908, May 24, 1909.

No. 20 from the same locality (O. E. Jennings, B. H. Smith and C. S. Sargent, September 25, 1905, O. E. Jennings, May 18, 1906, June 12 and October 3, 1908, May 24, 1909) with 12-20 stamens does not appear to differ in other characters from *C. radina*. The fruit, however, of No. 20 has not been collected. No. 57 from the same locality (O. E. Jennings, May 23, 1906, September 13, 1909) has the same general appearance and belongs probably also to the same species.



18. *Crataegus lætans* n. sp.

Glabrous with the exception of the hairs on the upper surface of the young leaves. *Leaves* oblong-ovate, acuminate, rounded or abruptly cuneate at the base, sharply often doubly serrate, with slender straight glandular teeth, and deeply divided usually only above the middle into 3 or 4 pairs of narrow acuminate spreading or reflexed lobes; nearly half-grown when the flowers open about the middle of May and then thin, light yellow-green and slightly roughened above by short white hairs and paler below, and at maturity thin, dark blue-green, lustrous and scabrate on the upper surface, pale bluish green on the lower surface, 4–5 cm. long and 2.5–4 cm. wide, with thin midribs and primary veins; petioles slender, slightly wing-margined at the apex, glandular, with occasional minute usually deciduous glands, 2–2.5 cm. in length; leaves on vigorous shoots thicker, rounded at the base, coarsely serrate, deeply divided into 4 or 5 pairs of acute lateral lobes and often 6–7 cm. long and wide. *Flowers* 1.2–1.3 cm. in diameter, on short slender pedicels, in small compact mostly 6–12-flowered corymbs, the elongated lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, the lobes long, slender, acuminate, entire, reflexed after anthesis; stamens 10; anthers deep rose color; styles 2–4, surrounded at the base by a narrow ring of pale hairs. *Fruit* ripening early in October and persistent until after the leaves have fallen, on slender drooping pedicels, in mostly 6–9-fruited clusters, obovate or rarely short-oblong, flattened or slightly depressed at the apex and rounded at the narrow base, sometimes 3–5-angled, dark orange-red, slightly pruinose, marked by numerous pale dots, 1.1–1.3 cm. in diameter; calyx little enlarged, with a deep narrow cavity, and small spreading often persistent lobes dark red on the upper side below the middle; flesh thick, rather succulent, greenish yellow, acidulous; nutlets usually 3 or 4, rounded at the apex, acute at the base, ridged on the back, with a low grooved ridge, 5–5.5 mm. long and 4–4.5 mm. wide.

A shrub 3–4 m. high, with smooth stems covered with dark gray scaly bark, and slender nearly straight branchlets dark orange-green when they first appear, becoming dark orange-brown, lustrous and marked by dark lenticels in their first season and dull reddish brown the following year, and armed with slender straight or slightly curved chestnut brown shining spines 2–3 cm. long and occasionally persistent and becoming branched on old stems.

Nine-mile Run, Pittsburgh, Allegheny County, O. E. and Grace K. Jennings, (No. 68 type) May 17, 1907, O. E. Jennings and B. H. Smith, October 5, 1907.

19. *Cratægus ruricola* n. sp.

Glabrous with the exception of the hairs on the upper surface of the young leaves. *Leaves* broad-ovate, acuminate, gradually narrowed and rounded or cuneate at the often unsymmetrical base, coarsely often doubly serrate, with straight glandular teeth, and deeply divided into 4 or 5 pairs of narrow acuminate spreading often recurved lobes; tinged with red when they unfold, about one-third grown when the flowers open early in May and then thin, yellow-green and roughened above by short white hairs, and at maturity thin, dark yellow-green and scabrate on the upper surface, paler on the lower surface, 5–8 cm. long and 3.5–6 cm. wide, with thin midribs and primary veins; petioles slender, slightly wing-margined at the apex, 2.5–4 cm. in length. *Flowers* on short stout pedicels, in small compact 4–8-, usually 4 or 5-flowered corymbs, the lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, the lobes gradually narrowed from the base, long, slender, acuminate, entire or minutely dentate near the middle, reflexed after anthesis; stamens 8–10; anthers pale pink; styles 3 or 4. *Fruit* ripening and falling early in October, on long slender pedicels, in few-fruited drooping clusters, obovate, full and rounded at the apex, gradually narrowed to the rounded base, scarlet, about 1.5 cm. long and broad; calyx little enlarged, with a short tube, a deep narrow cavity, and spreading lobes; flesh yellow, juicy; nutlets 3 or 4, broad and rounded at the apex, narrowed and acute at the base, ridged on the back, with a broad groove ridge, 5.5–6 mm. long and about 4 mm. wide.

A shrub 1.2–1.5 m. high, with small stems, and slender zigzag branchlets dark orange-green when they first appear, becoming light orange-brown, lustrous and marked by dark lenticels in their first season, and armed with numerous stout or slender straight or slightly curved chestnut brown spines 3.5–5 cm. long.

Chadsford, Delaware County, B. H. Smith and C. S. Sargent, (No. 250 type) October 3, 1904, B. H. Smith, May 6 and September 13, 1905, October 8, 1908.

20. *Cratægus effera* n. sp.

Glabrous with the exception of the hairs on the upper surface of the leaves. *Leaves* broad-ovate, acute or acuminate, rounded or abruptly cuneate at the wide base, finely often doubly serrate, with straight glandular teeth, and divided usually only above the middle into 3 or 4 pairs of short broad lobes; nearly half-grown when the flowers open late in May and then yellow-green and roughened above by short white hairs and glabrous below, and at maturity thick,

dark bluish green, scabrate or nearly smooth on the upper surface, pale on the lower surface, 5-6 cm. long and 4-4.5 cm. wide, with slender prominent midribs and primary veins; petioles stout, slightly wing-margined at the apex, glandular, with usually persistent glands, 2.5-3 cm. in length; leaves on vigorous shoots thicker, usually rounded at the base and often 6-7 cm. long and wide, with stout winged conspicuously glandular petioles. *Flowers* 2 cm. in diameter, on long slender pedicels in 7- or 8-flowered corymbs; calyx-tube narrowly obconic, the lobes long, slender, acuminate, entire or minutely dentate near the middle, reflexed after anthesis; stamens 7 or 8; anthers dark rose color; styles 3 or 4. *Fruit* ripening early in October, on slender drooping pedicels, in few-fruited clusters, obovate, full and rounded at the apex, slightly narrowed to the rounded base, orange-red, marked by small pale dots, 1-1.2 mm. long and broad; calyx little enlarged, with a deep narrow cavity pointed in the bottom, and small spreading and closely appressed lobes dull red on the upper side below the middle; flesh thin, dry and hard; nutlets 4 or 5, rounded at the apex, gradually narrowed and rounded at the base, rounded and slightly grooved on the back, 6.5-7 mm. long and about 4 mm. wide.

A shrub sometimes 5 m. high, with stout stems covered with dark scaly bark, and slender slightly zigzag branchlets dark dull chestnut brown and marked by small pale lenticels in their first season and dull gray-brown the following year, and armed with very stout nearly straight purplish spines 2.5-3 cm. long.

Country Club, Scranton, Lackawanna County, A. Twining, (No. 44 type) October 4, 1907, May 24 and September 19, 1908, B. H. Smith, A. Twining and C. S. Sargent, May 24, 1908; Taylor's Hill, near Scranton, A. Twining, (No. 43) June 8, 1907.

21. *Cratægus cœrulea* n. sp.

Glabrous with the exception of the hairs on the upper surface of the young leaves. *Leaves* ovate to oval, acuminate, abruptly or gradually narrowed and rounded or cuneate at the base, finely often doubly serrate, with straight glandular teeth, and slightly divided into 4 or 5 pairs of narrow acuminate lateral lobes; deeply tinged with red when they unfold, about one-half grown when the flowers open at the end of May and then thin, dark bluish green, smooth and slightly hairy above, with short soft hairs, and paler below, and at maturity thin, dark blue-green and smooth on the upper surface, pale blue-green on the lower surface, 3-4 cm. long and 2.5-3.5 cm. wide; petioles slender, slightly wing-margined at the apex, glandular, with minute usually deciduous glands, 1-1.3 cm.

in length; leaves on vigorous shoots broadly ovate and rounded at the base to rhombic, often 4-5 cm. long and 3.5-5 cm. wide, with stout glandular petioles broad-winged to below the middle. *Flowers* 1.5 cm. in diameter, on slender pedicels, in compact 5-10-flowered corymbs, the lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, the lobes gradually narrowed from the base, slender, acuminate, entire or minutely and irregularly glandular-dentate, reflexed after anthesis; stamens 5; anthers light rose color; styles 2-4, surrounded at the base by a broad ring of pale tomentum. *Fruit* ripening late in September, on slender pedicels, in few-fruited clusters. obovate, bright orange-red, lustrous, marked by small pale dots, 1-1.2 cm. long and broad; calyx little enlarged, with a wide shallow cavity, and spreading persistent lobes; flesh yellow, thin, and solid; nutlets 2-4, acute at the ends, ridged on the back, with a high narrow grooved ridge, about 5 mm. long and 3 mm. wide.

A shrub 2-2.5 m. high, with stems covered with smooth gray bark, and very slender slightly zigzag branchlets dark orange-green when they first appear, becoming light chestnut brown, lustrous and marked by small dark lenticels in their first season and dull reddish brown the following year, and armed with stout recurved chestnut brown shining spines 2.5-3.5 cm. long.

Lincoln Heights, near Scranton, Lackawanna County, A. Twining, (No. 4 type and No. 5), May 31 and September 25, 1907; (No. 45) September 20, 1907, May 1908; Keyser Valley, near Scranton, A. Twining, (No. 16, with larger fruit) May 25 and October 1, 1907, September, 1908.

##### 5. TENUIFOLIÆ.

Leaves thin, hairy on the upper surface early in the season, glabrous at maturity (scrabrate in No. 10), usually yellow-green; petioles long and slender. Flowers in glabrous corymbs; stamens 10 or less (in the following species); anthers rose color or pink. Fruit short-oblong to obovate, scarlet, lustrous, ripening in September; flesh soft and succulent; mature calyx small and sessile; nutlets 2-4. Calyx cavity of the fruit deep and narrow; fruit short-oblong to slightly obovate, usually about 1.2 cm. long and 1 cm. wide.

Petioles rarely more than 2 cm. in length.

Flowers up to 1.8 cm. in diameter; anthers dark rose color.

1. *C. tenella*.

Flowers not more than 1.2 cm. in diameter; anthers light rose color.....2. *C. angustisepala*.

Petioles more than 2 cm. in length.

Corymbs 8-12-flowered; fruit short-oblong to slightly obovate.

- Lobes of the leaves in 4 or 5 pairs.  
 Lobes of the leaves narrow, long-pointed...3. *C. glaucophylla*.  
 Lobes of the leaves short, acuminate.....4. *C. insolita*.  
 Lobes of the leaves in 6 or 7 pairs, small and spreading.  
 5. *C. flammata*.  
 Corymbs 4- or 5-flowered; lobes of the leaves long, narrow,  
 spreading or recurved.....6. *C. siderea*.  
 Calyx cavity of the fruit wide and shallow.  
 Leaves smooth.  
 Lobes of the leaves long, spreading, often recurved; fruit  
 obovate, becoming oval when fully ripe.....7. *C. rufipes*.  
 Lobes of the leaves small and spreading; fruit short-oblong;  
 leaves blue-green.....8. *C. antheina*.  
 Lobes of the leaves narrow, acuminate, usually pointing  
 toward the apex of the leaf; fruit short-oblong.  
 9. *C. propensa*.  
 Leaves scabrate on the upper surface; fruit pruinose.  
 10. *C. Heidelbergensis*.

1. *Cratægus tenella* Ashe.

Ann. Carnegie Mus., I, pt. 3, 338 (1902); Sargent, Bot. Gazette, XXXV,  
 108 (The Genus *Cratægus* in Newcastle County, Delaware); Proc. Acad.  
 Nat. Sci. Phila., 1905, 608.

Roadsides and fields between Stroudsburg and Tannersville, Monroe  
 County, B. H. Smith and C. S. Sargent, (Nos. 1, 3 and 6) May 22,  
 1908, B. H. Smith, September 19, 1908; near Scranton, Lackawanna  
 County, A. Twining, (No. 24) October 3, 1907, May 24, 1908; Dunmore,  
 near Scranton, A. Twining, (No. 20) October 3, 1907, May 24, 1908;  
 valley of the Little Juniata River below Altoona, Blair County, B. H.  
 Smith, (No. 260) May 20, 1905; valley of the Conemaugh between  
 Wilmore and Portage, Blair County, B. H. Smith, (No. 271) May 21,  
 1905, May 17, 1906, B. H. Smith and C. S. Sargent, September 26, 1905,  
 (No. 274) B. H. Smith, May 21, 1905, B. H. Smith and C. S. Sargent,  
 September 26, 1905; near Wilmore, Blair County, B. H. Smith and  
 C. S. Sargent, (No. 274½) September 26, 1905, B. H. Smith, May 17,  
 1906; also eastern Pennsylvania and northern Delaware.

No. 210 from near Kutztown resembles *C. tenella* in its fruit; the  
 leaves are somewhat thicker and darker green, and the flowers are  
 more cup-shaped. This plant grows on hillsides, while *C. tenella* in  
 this region is usually found only on low ground.

2. *Cratægus angustisepala* n. sp.

Glabrous with the exception of the hairs on the upper surface  
 of the young leaves. *Leaves* obovate to oval or ovate, acuminate  
 and long-pointed at the apex, cuneate at the base, finely often doubly

serrate, with straight or incurved glandular teeth, and very slightly divided usually only above the middle into 2 or 3 pairs of narrow acuminate lobes; about half-grown when the flowers open late in May and then yellow-green and roughened above by short white hairs and pale below, and at maturity very thin, dark yellow-green and smooth on the upper surface, paler on the lower surface, 3-4 cm. long and 2.5-3 cm. wide, with thin midribs and primary veins; petioles slender, slightly wing-margined at the apex, glabrous, with small scattered often persistent glands, 1.2-1.8 cm. in length. *Flowers* 1-1.2 cm. in diameter, on long very slender pedicels, in small mostly 6-8-flowered corymbs, with small linear-obovate to linear glandular bracts and bractlets often persistent until the flowers open, the long lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, the lobes long, very slender, acuminate, entire or minutely glandular-dentate near the middle, reflexed after anthesis; stamens 5-10; anthers light rose color; styles 3. *Fruit* ripening about the 20th of September, on slender red pedicels, in few-fruited clusters, short-oblong to slightly obovate, full and rounded at the ends, scarlet, lustrous, 1.2-1.3 cm. long and about 1 cm. in diameter; calyx little enlarged, with a deep narrow cavity, and small spreading lobes dark red on the upper side below the middle; flesh thin, yellow, soft and juicy; nutlets 3, gradually narrowed and rounded at the ends or acute at the apex, ridged on the back, with a broad low grooved ridge, 5-6.5 mm. long and 3-3.5 mm. wide.

A shrub 3-4 m. high, with slender stems covered with smooth pale gray bark and spreading into thickets, and slender zigzag branchlets, bright green when they first appear, becoming light chestnut-brown, lustrous and marked by small pale lenticels in their first season and dull red-brown the following year, and armed with numerous slender straight or curved chestnut-brown spines 2-3 cm. long.

Low moist soil in meadows, Throop, near Scranton, Lackawanna County, A. Twining, (No. 21 type and No. 22) May 24 and September 22, 1907; near Scranton, A. Twining, (No. 23) May 24, 1907, September 29, 1908; Dunmore, near Scranton, A. Twining, (No. 27) May 28, 1907, September 20, 1908; near Scranton, A. Twining, (No. 53) September, 1907; Chinchilla, Lackawanna County, A. Twining, (No. 65) October 3, 1907.

No. 28 from Dunmore with larger flowers, 5-10 stamens and larger fruit, provisionally referred to this species, is perhaps distinct. A. Twining, May 28 and September 27, 1907.

3. *Cratægus glaucophylla* Sargent.

Rhodora, V, 140 (1903); Proc. Rochester Acad. Sci., IV, 12; Bull. Michigan State Board Geolog. Surv., 1906, 536; No. 4, Ontario Nat. Sci. Bull., 36; Bull. CXXII, N. Y. State Mus., 102.

Charleroi, Washington County, O. E. Jennings and Grace E. Kinzer, (No. 37) October 7, 1905, O. E. Jennings, May 21 and October 14, 1907; near Hillside Station, Westmoreland County, O. E. Jennings, (No. 77) May 25, 1907, O. E. and Grace K. Jennings, September 16, 1909; also western New England, western New York and through southern Ontario to southern Michigan.

4. *Cratægus insolita* Sargent.

Proc. Acad. Nat. Sci. Phila., 1905, 622.

Berks County, woods beyond reservoir on hill, near Kutztown, C. L. Gruber, (No. 140) May 15, 1906; North Heidelberg Township, C. L. Gruber, (No. 181) September 8, 1906; Lackawanna County, Lincoln Heights, Scranton, A. Twining, (No. 2) May 31, 1907, September 27, 1908; Keyser Valley, Scranton, A. Twining, (No. 11) May 27 and October 1, 1907; Virginia near Scranton, A. Twining, (No. 40) May 29, 1907; also in Delaware County.

5. *Cratægus flammata* n. sp.

*Leaves* ovate, acuminate and long-pointed at the apex, rounded, abruptly cuneate or slightly cordate at the base, finely often doubly serrate, with straight glandular teeth, and divided into 6 or 7 pairs of small acuminate spreading lateral lobes; nearly half grown when the flowers open about the 20th of May and then very thin, yellow-green and roughened above by short white hairs and pale blue-green below, and at maturity thin, yellow-green, smooth and glabrous on the upper surface, 5–6 cm. long and 3.5–4.5 cm. wide, with thin midribs and primary veins; petioles slender, slightly wing-margined at the apex, glandular, with minute often persistent glands, 2.5–4.5 cm. in length. *Flowers* 1.5 cm. in diameter, on slender pedicels, in mostly 7–10-flowered corymbs, the long lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, the lobes gradually narrowed from wide bases, acuminate and red at the apex, minutely glandular-serrate below the middle, reflexed after anthesis; stamens 5–8; anthers dark rose color; styles 2–4, surrounded at the base by a narrow ring of pale tomentum. *Fruit* ripening in September and persisting late into October, on short slender reddish pedicels, in few-fruited clusters, short oblong, full and rounded at the ends, scarlet, lustrous, marked by occasional small pale dots, 1–1.2 cm. long and 8–10 mm. in diameter; calyx little enlarged, with a deep narrow cavity, and small spreading

lobes dark red on the upper side below the middle; flesh yellow, sweet and of pleasant flavor; nutlets 2-4, gradually narrowed and rounded at the ends, ridged on the back, with a low slightly grooved ridge, 5-6 mm. long and 3-4 mm. wide.

A shrub 2-3 m. high, with small erect stems covered with green-gray bark, and slender only slightly zigzag branchlets, dull chestnut brown and marked by large pale lenticels in their first season and dull gray-brown the following year, and armed with stout light brown ultimately gray spines 2.5-3 cm. long.

Woods, Birdseye, near Scranton, Lackawanna County, A. Twining, (No. 61 type) October 23, 1907.

6. *Crataegus siderea* n. sp.

Glabrous with the exception of the hairs on the upper surface of the young leaves. *Leaves* ovate to oval or obovate, acuminate, gradually or abruptly narrowed to the entire base, finely doubly serrate above, with straight glandular teeth, and deeply divided often only above the middle into long narrow spreading or recurved acuminate lobes, about half-grown when the flowers open the middle of May and then very thin, yellow-green, and covered above by short white hairs and pale and glabrous below, and at maturity thin, yellow-green and scabrate on the upper surface, pale on the lower surface, 4-6 cm. long and 3-4 cm. wide, with slender midribs, and thin obscure primary veins; petioles slender, slightly wing-margined at the apex, 2-2.5 cm. in length. *Flowers* 1 cm. in diameter, on long slender pedicels, in small 4- or 5-flowered corymbs, the lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, the lobes long, slender, acuminate, entire, reflexed after anthesis; stamens 7-9, usually 8; anthers rose color; styles 3 or 4. *Fruit* ripening late in September, on long slender pedicels, in drooping clusters, obovate, gradually narrowed to the long base, light yellow-green, becoming dark red when fully ripe, marked by small dark dots, 1-1.2 cm. long and 9-10 mm. in diameter near the rounded apex; calyx little enlarged, with a short tube, a deep narrow cavity pointed and tomentose in the bottom, and reflexed closely appressed lobes; flesh thin, dry and mealy; nutlets 3 or 4, narrowed and rounded at the ends, rounded and slightly ridged on the back, 5-5.5 mm. long and 3.5-4 mm. wide.

A shrub 3-4 m. high, with small stems, and slender zigzag branchlets dark orange-green and marked by pale lenticels when they first appear, becoming light chestnut brown and lustrous in their first season and dull red-brown the following year, and armed with numerous slender straight or slightly curved chestnut brown spines 2-3 cm. long.



Hill above Panther Hollow, Schenley Park, Pittsburg, Allegheny County, O. E. and Grace K. Jennings, (No. 70 type) May 17, 1907, O. E. Jennings, September 4, 1908, September 13, 1909.

7. *Cratægus rufipes* Ashe.

Jour. Elisha Mitchell Sci. Soc., XX, 51 (1904); Sargent, Proc. Acad. Nat. Sci. Phila., 1905, 609.

Keyser Valley, Scranton, Lackawanna County, B. H. Smith and A. Twining, (No. 66) May 23, 1908, A. Twining, September 14, 1908, (No. 57) A. Twining, October 22, 1907, September 23, 1908; borders of woods, Shady Valley Road, near Orbisonia, Huntingdon County, B. H. Smith, (No. 318) May 20, 1906, October 8, 1907, (No. 310) May 20, 1906, May 27 and October 8, 1907, B. H. Smith and C. S. Sargent, May 27, 1908; meadows near Altoona, Blair County, B. H. Smith and C. S. Sargent, (No. 291) September 25, 1905; near Hillside Station, Westmoreland County, O. E. Jennings, (No. 76) May 25, 1907, O. E. and Grace K. Jennings, September 16, 1908; also in Berks and Bucks Counties.

8. *Cratægus antheina* n. sp.

Glabrous with the exception of the hairs on the upper surface of the young leaves. *Leaves* ovate, acuminate, abruptly cuneate or rounded at the base, finely often doubly serrate, with straight glandular teeth, and divided into 4 or 5 pairs of small acuminate spreading lateral lobes; less than half grown when the flowers open about the 10th of May and then thin, bluish green and roughened above by small white hairs, and at maturity thin, dark blue-green, smooth and lustrous on the upper surface, paler on the lower surface, 4.5–6.5 cm. long and 3–4.5 cm. wide, with thin midribs and primary veins; petioles slender, slightly wing-margined at the apex, glandular, with often persistent glands, 1.5–3 cm. in length. *Flowers* 1.6–2 cm. in diameter, on long slender pedicels, in 5–10-flowered corymbs, the lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, the lobes long, slender, acuminate, minutely glandular-serrate or sometimes entire, reflexed after anthesis; stamens 5–8; anthers dark rose color; styles 3 or 4, surrounded at the base by a narrow ring of pale tomentum. *Fruit* ripening the end of September, on long slender drooping pedicels, in few-fruited clusters, short-oblong, full and rounded at the apex, gradually or abruptly narrowed at the base, scarlet, marked by small pale dots, slightly glaucous, 1–1.3 cm. long and 9–12 mm. in diameter; calyx little enlarged, with a wide shallow cavity, and spreading and reflexed often deciduous lobes; flesh thin, yellow, rather juicy; nutlets 3 or 4, narrowed at

the apex, broader and rounded at the base, ridged on the back, with a broad low doubly grooved ridge 7–7.5 mm. long 4–4.5 mm. wide, with a prominent hypostyle extending to below the middle of the nutlet.

A shrub, with slender zigzag branchlets light orange-green and marked by pale lenticels when they first appear, becoming light orange-brown in their first season and darker-colored the following year, and armed with numerous slender slightly curved light red-brown spines 2–4.5 cm. long.

Borders of woods near West Leesport, Bucks County, C. L. Gruber, (No. 219 A type) September 29, 1905, May 13 and September 15, 1906, October 3, 1909.

9. *Cratægus propensa* n. sp.

Glabrous with the exception of the hairs on the upper surface of the young leaves and on the calyx-lobes. *Leaves* oblong-ovate, acuminate, rounded or cuneate at the base, finely often doubly serrate, with straight glandular teeth, and divided into 5 or 6 pairs of narrow acuminate lobes usually pointing toward the apex of the leaf; more than half-grown when the flowers open about the 20th of May and then dark yellow-green, lustrous and slightly roughened above by short white hairs and pale bluish green below, and at maturity very thin, yellow-green, smooth, glabrous and lustrous on the upper surface, paler on the lower surface, 5–6 cm. long and 3.5–4 cm. wide, with thin midribs and primary veins; petioles slender, slightly wing-margined at the apex, often rose color in the autumn, 2–2.5 cm. in length. *Flowers* 1.8 cm. in diameter, on long slender pedicels, in wide lax mostly 9–12-flowered corymbs, the elongated lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, the lobes gradually narrowed from wide bases, long, slender, acuminate, entire, very slightly hairy on the inner surface, reflexed after anthesis; stamens 6–10; anthers dark rose color; styles 3 or 4. *Fruit* ripening the middle of September, on elongated pedicels, in few-fruited drooping clusters, short-oblong, full and rounded at the ends, scarlet, lustrous, marked by small pale dots, 1–1.2 cm. long and 8–10 mm. in diameter; calyx little enlarged, with a wide deep cavity pointed in the bottom, and spreading and appressed lobes dark red on the upper side below the middle, their tips often deciduous from the ripe fruit; flesh yellow, thick, soft and succulent; nutlets 3 or 4, rounded at the apex, acute at the base, only slightly ridged and occasionally grooved on the back, about 7 mm. long and 4 mm. wide.

A shrub 4–5 m. high, with numerous stems sometimes 12–15 cm.

in diameter, and slender nearly straight branchlets dark orange-green more or less tinged with red and marked by pale lenticels when they first appear, becoming light chestnut red and lustrous in their first season and dull red-brown or gray the following year, and armed with occasional straight very stout gray spines 1.5–2 cm. long.

Hillsides, Keyser Valley, Scranton, Lackawanna County, A. Twining, B. H. Smith and C. S. Sargent, (No. 68 type) May 23, 1908, A. Twining, September 14, 1908, (No. 12) A. Twining, September 23, 1908.

10. *Cratægus heidelbergensis* n. sp.

Glabrous with the exception of the hairs on the upper surface of the young leaves. *Leaves* oblong-ovate, acuminate and long-pointed at the apex, rounded or abruptly cuneate at the wide base, finely often doubly serrate, with straight glandular teeth, and rather deeply divided into 3–6, usually 5, pairs of narrow acuminate spreading lobes; nearly half-grown when the flowers open from the 10th to the middle of May and then light yellow-green and roughened above by short white hairs and pale below, and at maturity thin, dark yellow-green and scabrate on the upper surface, pale bluish green on the lower surface, 4–6.5 cm. long and 2.5–4 cm. wide, with thin conspicuous midribs and primary veins; petioles slender, slightly wing-margined at the apex, 1.5–2 cm. in length; leaves on vigorous shoots usually rounded at the base, more coarsely serrate, more deeply lobed and often 7–8 cm. long and 6 cm. wide. *Flowers* 1.4–1.7 cm. in diameter, on long slender pedicels, in lax usually 6–12-flowered corymbs, the long lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, the lobes gradually narrowed from the base, linear, acuminate and red at the apex, entire or minutely glandular-dentate near the middle, reflexed after anthesis; stamens 5–8, rarely 9; anthers purple; styles 2–5, usually 3 or 4, surrounded at the base by a narrow ring of pale tomentum. *Fruit* ripening the end of August and falling early in September, on long slender pedicels, in few-fruited clusters, obovate or rarely short-oblong to subglobose, scarlet frequently blotched with russet, marked by small pale dots, occasionally slightly pruinose, 1.2–1.7 cm. long and 1.2–1.5 cm. thick; calyx little enlarged, with a broad deep cavity tomentose in the bottom, and spreading and appressed generally persistent lobes dark red on the upper side below the middle; flesh orange-yellow slightly tinged with red, soft and acid; nutlets usually 3 or 4, rounded at the apex, acute at the base, rounded and slightly grooved or ridged on the back, 5.5–6 mm. long and about 4 mm. wide.

A shrub 3-4 m. high, with numerous large angular ridged stems and branches covered with dark gray bark and usually spreading into thickets, and slender zigzag branchlets dark olive-green tinged with red when they first appear, becoming light chestnut brown, very lustrous and marked by pale lenticels in their first season and olive-brown to red-brown the following year, and armed with numerous stout straight or slightly curved light chestnut brown shining spines 2.5-5 cm. long.

Dry gravelly soil, Forge Hill, North Heidelberg Township, near Kutztown, Berks County, common; C. L. Gruber, (No. 173 type) May 12 and September 8, 1902; border of stony upland woods about three miles north of Kutztown, C. L. Gruber, (Nos. 203 and 237) May 15, August 1 and September 6, 1906.

#### 6. MOLLES.

Leaves thin, broad, cuneate or rounded at the base; petioles long; flowers large, in many-flowered corymbs; fruit subglobose or obovate, scarlet, more or less pubescent at the ends, up to 2.5 cm. in diameter, with thick succulent flesh; nutlets 3-5, narrowed at the ends, only slightly ridged; stamens in the following species usually 10; anthers pink or rose color.

***Cratægus pennsylvanica* Ashe.**

Ann. Carnegie Mus., I, pt. III, 394 (1902).

*Leaves* ovate, acuminate, rounded or abruptly cuneate at the base, coarsely often doubly serrate, with straight glandular teeth, and slightly divided into 3 or 4 pairs of short broad acuminate lobes; slightly tinged with red when they unfold, more than half-grown when the flowers open the middle of May and then thin, dark yellow-green and roughened above by short white hairs and villose on the midribs and veins below, and at maturity thin, dark yellow-green and scabrate on the upper surface, paler, scabrate and still somewhat villose on the stout midribs and primary veins, 6.5-8 cm. long and 5-6 cm. wide; petioles slender, slightly wing-margined at the apex, villose through the season, occasionally glandular, 3-3.5 cm. in length; leaves on vigorous shoots rounded or truncate at the base, very coarsely serrate, more deeply lobed, often 10-12 cm. long and broad, with stout midribs, prominent primary veins, conspicuously glandular petioles, and large foliaceous lunate coarsely glandular-serrate persistent stipules. *Flowers* 1.8-2 cm. in diameter, on slender densely villose pedicels, in broad lax hairy mostly 8-15-flowered corymbs, with oblong-obovate to linear-obovate glandular bracts and bractlets, the

elongated lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, covered with long white hairs, the lobes long, slender, acuminate, laciniately glandular-serrate, glabrous on the outer surface, villose on the inner surface, reflexed after anthesis; stamens 8-12; anthers faintly tinged with pink; styles 3-5. *Fruit* ripening and falling early in October, on short stout drooping slightly hairy pedicels, in 4-12-fruited clusters, short-obovate, full and rounded at the apex, bright orange-red marked by small pale dots, puberulous at the ends, 1.8-2.5 cm. in diameter; calyx little enlarged, with a deep narrow cavity wide and tomentose in the bottom, and small spreading lobes dark red on the upper side below the middle, their tips often deciduous from the ripe fruit; flesh thick, orange-yellow, somewhat acidulous, fragrant, edible, sometimes made into jelly; nutlets 3-5, rounded at the apex, acute at the base, rounded and slightly grooved or ridged on the back, the conspicuous hypostyle extending to the middle of the nutlet, about 8 mm. long and 5 mm. wide.

A tree sometimes 10 m. high, with a tall trunk often 4 dm. in diameter, covered with dark gray scaly bark, large spreading branches forming a wide symmetrical round-topped head, and stout slightly zigzag branchlets dark orange-green and more or less tinged with red when they first appear, becoming dark chestnut brown, marked by large dark lenticels and more or less pubescent in their first season, dark red-brown the following year, and armed with stout straight or slightly curved chestnut brown shining spines 3-4 cm. long.

Meadows, in low moist soil, near Pittsburg, Allegheny County, common; J. A. Shafer, Stowe Township, near Turner Station, October 3, 1901, J. A. Shafer and W. W. Ashe, October, 1901; near Pittsburg, (type tree) O. E. Jennings, B. H. Smith and C. S. Sargent, September 28, 1905; Riverview Park, Allegheny City, Allegheny County, O. E. Jennings and Grace E. Kinzer, (No. 30) October 2, 1905, O. E. Jennings, May 24, 1906, May 20, September 14 and October 14, 1907, O. E. Jennings, B. H. Smith and C. S. Sargent, (No. 23) September 25, 1905, O. E. and Grace K. Jennings, May 18, 1907, O. E. Jennings, September 22, 1907.

Specimens of a species in this group collected in the valley of the Conemaugh between Portage and Wilmore, in Cambria County, by Mr. B. H. Smith, (No. 276) May 21, 1905, and May 17, 1906, is probably *C. Ellwangeriana* Sargent. The specimens show the peculiar stipules of that species, but without the fruit this determination is only provisional, and it has been impossible to obtain fruit from this tree

as in 1905 and 1906 insects destroyed the flowers as soon as they opened.

#### 7. COCCINEÆ.

Leaves large, thin, oblong, acutely and more or less deeply lobed; petioles long; flowers in usually wide many-flowered corymbs; anthers pink, rose color or purple; fruit subglobose, short-oblong, obovate or oval, scarlet, 1-2.2 cm. long; flesh succulent; nutlets 3-5, prominently grooved, and usually ridged on the back; stamens in the following species usually less than 10. (*Coccineæ*, Loudon, *Arb. Brit.*, II, 816 [1838]; Eggleston, *Gray Man.*, ed. 7, 473. *Flabellatæ*, Sargent, *Rhodora*, III, 22 [1901].)

Fruit subglobose to short-oblong.

Flowers not more than 1.6 cm. in diameter, on short densely villose pedicels; fruit 1-1.2 cm. in diameter.....1. *C. Burkeana*.

Flowers up to 2.2 cm. in diameter, on long only slightly hairy pedicels; fruit 1.4-1.9 cm. long.....2. *C. sejuncta*.

Fruit depressed-globose to slightly obovate.....3. *C. pedicellata*.

Fruit obovate or oval.

Flowers not cup-shaped, in small compact 8-12-flowered corymbs; leaves broadly ovate; fruit obovate.....4. *C. cristata*.

Flowers cup-shaped, in broad many-flowered corymbs; leaves oval to ovate; fruit oval.....5. *C. Holmesiana*.

#### 1. *Cratægus Burkeana* n. sp.

*Leaves* ovate, acute or acuminate, abruptly cuneate or rounded at the base, sharply often doubly serrate, with straight glandular teeth, and slightly divided into 4 or 5 pairs of small acute lateral lobes; nearly half-grown when the flowers open about the 10th of May and then thin, light yellow-green and roughened above by short white hairs and paler and sparingly villose on the midribs and veins below, and at maturity thin, yellow-green and scabrate on the upper surface, nearly glabrous on the lower surface, 5-8 cm. long and 4.5-8 cm. wide, with stout midribs, and thin prominent primary veins; petioles slender, slightly wing-margined at the apex, densely villose early in the season, becoming almost glabrous, 1.5-3 cm. in length; leaves on vigorous shoots usually cordate at the broad base, more coarsely serrate and more deeply lobed and often 8-10 cm. long and broad, with thicker midribs and primary veins and stout glandular petioles. *Flowers* 1.2-1.6 cm. in diameter, on short densely villose pedicels, in small compact hairy mostly 5-10-flowered corymbs, the lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, slightly villose, the lobes long, slender, acuminate, coarsely glandular-serrate, glabrous on the outer surface, villose on the inner surface, reflexed after anthesis; stamens 5-8; anthers dark purple; styles

3-5. *Fruit* ripening late in September, on slender drooping slightly hairy pedicels, in wide clusters, subglobose to short-oblong or slightly obovate, rounded at the ends, crimson, lustrous, marked by small pale dots, 1-1.2 cm. in diameter; calyx prominent, with a wide shallow cavity, and spreading lobes, dark red on the upper side below the middle; flesh thick, light orange-yellow, juicy, acidulous; nutlets 3-5 acute at the apex, narrowed and rounded at the base, rounded and sometimes slightly grooved on the back, about 5 mm. long and 3 mm. wide.

A tree 5 or 6 m. high, with a trunk 2 dm. in diameter, covered with dark gray flaky bark, large spreading branches forming a round-topped head, and slender only slightly zigzag glabrous branchlets dark orange-green when they first appear, becoming light chestnut brown, lustrous and marked by dark lenticels in their first season and dark red-brown the following year, and armed with slender straight chestnut brown shining spines 2-2.5 cm. long.

Schenly Park, Pittsburg, Allegheny County, O. E. Jennings, B. H. Smith and C. S. Sargent, (No. 21 type) September 28, 1905, O. E. Jennings and Grace E. Kinzer, May 24, 1906, May 17, 1907, O. E. Jennings, September 27, 1907.

This species is named for Mr. George William Burke, Superintendent of the Parks of Pittsburg, who has aided materially Dr. Jennings in his investigations of *Cratægus* in that city.

2. *Cratægus sejuncta* Sargent.

Bull. N. Y. State Mus., CV, 65 (1906), CXXII, 71; No. 4, Ontario Nat. Sci. Bull., 48.

Roadside near Robesonia, Berks County, C. L. Gruber, (No. 226) August 2 and September 2, 1905, May 12, 1906; also western New England, and through New York to southern Ontario.

From the type at West Albany, New York, of this widely distributed and rather variable species the Robesonia plant differs in its somewhat larger flowers (1.5-2 cm. in diameter), in its 15-20-flowered (not 8-10-flowered) corymbs, in the presence of a few hairs on the calyx-tube, and in its rather larger fruits.

3. *Cratægus pedicellata* Sargent.

Bot. Gazette, XXXI, 226 (1901); Silva N. Am., XIII, 101, t. 677; Proc. Rochester Acad. Sci., IV, 116; Man., 448, f. 365; No. 4 Ontario Nat. Sci. Bull., 46; Bull. N. Y. State Mus., CXXII, 69; Eggleston, Gray's Man., ed. 7, 475 (in part).

Between Stoope's Ferry and Carnot, Allegheny County, O. E. Jennings and Grace E. Kinzer, (No. 31) October 4 and 6, 1905, O. E.

Jennings, May 20, 1907, B. H. Smith, O. E. and Grace K. Jennings, October 9, 1907; Linesville, Crawford County, O. E. Jennings, (No. 91) October 9, 1907; also southern Ontario to western New York.

In the Pennsylvania plant the stamens are often only 5-7 and the mature leaves are rather less scabrate than those of *C. pedicellata* as it grows near Rochester, New York, where the species was first distinguished.

4. *Cratægus cristata* Ashe.

Ann. Carnegie Mus., I, pt. III, 392 (1902).

*Leaves* ovate, acute or acuminate, abruptly cuneate or rounded at the broad base, sharply often doubly serrate, with straight glandular teeth, and divided into 4 or 5 pairs of narrow acuminate lateral lobes; deeply tinged with red and villose on both surfaces when they unfold, nearly one-third grown when the flowers open about the 10th of May and then very thin, light yellow-green and roughened above by short white hairs, and paler and slightly villose on the midribs below, and at maturity thin, scabrate, dark yellow-green on the upper surface, paler on the lower surface, 7-9 cm. long and 6-7 cm. wide, with slender midribs and thin primary veins arching obliquely to the points of the lobes; petioles slender, slightly wing-margined at the apex, villose through the season, occasionally glandular, with persistent glands, 2-3 cm. in length; leaves on vigorous shoots rounded or truncate at the wide base, more coarsely serrate and more deeply lobed, and often 9-10 cm. long and broad, with stout petioles sometimes 4-5 cm. long. *Flowers* 1.7-1.8 cm. in diameter, on short pedicels, in small compact slightly hairy mostly 8-12-flowered corymbs, the long lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, glabrous, the lobes long, slender, acuminate, minutely glandular-dentate, glabrous on the outer, slightly villose on the inner surface, reflexed after anthesis; stamens 5-8; anthers dark pink; styles 3-5. *Fruit* ripening late in September, on long drooping red pedicels, in few-fruited clusters, obovate, full and rounded at the apex, gradually narrowed at the base, deep orange-red, marked by small pale dots, often glaucous, 1.2-1.4 cm. long and 1.1-1.2 cm. in diameter; calyx prominent, with a wide deep cavity pointed in the bottom, and small coarsely serrate persistent lobes; flesh thick, light orange-yellow, juicy, acidulous; nutlets 3-5, gradually narrowed and rounded at the ends, ridged on the back, with a broad low rounded ridge, 7-7.5 mm. long and 4-4.5 mm. wide.

A tree occasionally 5-7 m. high, with a short trunk 1.5-2 dm. in diameter, covered with dark gray scaly bark, or often shrubby, with



numerous large stems, and slender slightly zigzag branchlets dark orange-green more or less tinged with red and covered with matted pale hairs when they first appear, becoming dull light chestnut brown in their first season and darker-colored the following year, and armed with many stout straight purple spines 2.5–3 cm. long.

Stowes Township, near Turner Station, Allegheny County, W. W. Ashe and J. A. Shafer, October 1901; on a hillside facing Forbes Avenue, opposite Woodland Avenue, Pittsburg, Allegheny County, W. W. Ashe and J. A. Shafer, October 1901, May 1902; Schenley Park, Pittsburg, Allegheny County, O. E. Jennings, B. H. Smith and C. S. Sargent, (No. 22) September 28, 1905, O. E. Jennings, May 24, 1906, May 17 and September 22, 1907; on the flood plain of the Olive River at Fleming Park beyond McKee's Rocks, near Pittsburg, Allegheny County, O. E. Jennings, B. H. Smith and C. S. Sargent, (No. 25, with rather smaller fruit containing often 4 or 5 nutlets), September 29, 1905, O. E. Jennings, May 17, 1907; Nine-mile Run, Pittsburg, O. E. Jennings, October 9, 1905, O. E. and G. K. Jennings, (No. 42, with more hairy corymbs) May 17, 1907. East Altoona, Blair County, B. H. Smith, (No. 265) May 20, 1905, May 17, 1906, B. H. Smith and C. S. Sargent, September 25, 1905; valley of the Conemaugh, between Portage and Wilmore, Cambria County, B. H. Smith, May 21, 1905, B. H. Smith and C. S. Sargent, September 26, 1905.

5. *Cratægus Holmesiana* Ashe.

Jour. Elisha Mitchell Sci. Soc., XVI, pt. II, 78 (1900); Sargent, Silva N. Am., XIII, 119, t. 676; Proc. Rochester Acad. Sci., IV, 114; Man., 449, f. 366; Proc. Acad. Nat. Sci., Phila., 1905, 630; No. IV, Ontario Nat. Sci. Soc. Bull., 53; Bull. CXXII, N. Y. State Mus., 71; Eggleston, Gray Man., ed. 7, 473.

Keyser Valley, Scranton, Lackawanna County, A. Twining, B. H. Smith and C. S. Sargent, (No. 67) May 23, 1906, A. Twining, September 14, 1908; Orbisonia, Huntingdon County, B. H. Smith, (No. 315) May 20, 1906, October 8, 1907; also Bucks and Berks Counties (var. *villipes* Ashe), and from Ontario to New England.

8. ROTUNDIFOLIÆ.

Leaves subcoriaceous or thin, obovate to ovate or rhombic, cuneate at the base; petioles short or long. Flowers in mostly glabrous many- or few-flowered corymbs; anthers yellow or rose color. Fruit subglobose to short-oblong or obovate, red, ripening late, 1–1.5 cm. in diameter; nutlets usually 3 or 4. (*Rotundifoliæ*, Eggleston, Rhodora, X, 75 [1908]; *Coccineæ*, Sargent, Rhodora, III, 26 (not Loudon) [1901].)

Corymbs many-flowered; stamens 10; anthers pale yellow; fruit subglobose.

Leaves subcoriaceous; fruit 1.2–1.5 cm. in diameter.

1. *C. rotundifolia*.

Leaves thin; fruit usually less than 1 cm. in diameter.

2. *C. Dodgei*.

Corymbs few-flowered.

Stamens 10 or less.

Anthers pale yellow; stamens 10; leaves broadly ovate, thick; fruit subglobose to short-oblong.....3. *C. grossa*.

Anthers slightly tinged with pink; stamens 5 or 6; leaves rhombic to slightly obovate, thin; fruit obovate.

4. *C. dacrioides*.

Stamens 10–15; anthers cream color; leaves ovate to obovate, thin.....5. *C. varians*.

Stamens 20 (15–20 in No. 9).

Anthers cream color.

Flowers less than 2 cm. in diameter, in 3–6-flowered corymbs.

Leaves obovate, crenately serrate, glabrous.

6. *C. Brownii*.

Leaves ovate to oval or rhombic, with straight teeth, villose above while young.....7. *C. repentina*.

Flowers at least 2.5 cm. in diameter, in 5–12-flowered corymbs; leaves ovate to obovate, villose while young.

8. *C. scopulorum*.

Anthers rose color; leaves broadly ovate to obovate; fruit subglobose, usually broader than long.....9. *C. ignava*.

1. *Cratægus rotundifolia* (Ehrhart) Moench.

Bäum. Weiss, 29, t. 1 (1785). Eggleston, Britton N. Am. Trees, 464; Gray Man., ed. 7, 468.

*Mespilus glandulosa* Ehrhart. Beitr., III, 20 (1788).

*Cratægus horrida* Medicus, Gesch. Bot., 84 (1793).

*Mespilus rotundifolia* Du Roi, Harbk. Baume (excl. syn. *Cratægus glandulosa* Aiton) (1795).

*Cratægus glandulosa* Willdenow, Berl. Baumz., 84 (excl. syn. *Cratægus sanguinea*) (1796).

*Cratægus coccinea* Lindley, Bot. Reg., XXIII, t. 1957 (not Linnæus) (1837).

*Cratægus coccinea*, var. *rotundifolia* Sargent, Bot. Gazette, XXXI, 14 (1900); Silva N. Am., XIII, 134; Man., 460; Proc. Acad. Nat. Sci. Phila., 1905, 631; Bull. N. Y. State Mus., CV, 64, CXXII, 72.

*Cratægus rotundifolia* var. *Bicknellii* Eggleston, Rhodora, X, 79 (1908); Gray Man., ed. 7, 469.

Keyser Valley, near Scranton, Lackawanna County, A. Twining, (No. 14) May 23 and September 14, 1908, June 4, 1909; East Altoona, Blair County, B. H. Smith and C. S. Sargent, (No. 290), B. H. Smith, May 17, 1906; between Portage and Wilmore, Cambria County, B. H. Smith, May 21, 1905, B. H. Smith and C. S. Sargent, September 26, 1905; also eastern Canada and New England to Illinois.

2. *Cratægus Dodgei* Ashe.

Elisha Mitchell Sci. Soc., XIX, 26 (March, 1901); Sargent, Proc. Acad. Nat. Sci. Phila., 1905, 632; Rhodora, VII, 213; Bull. CV, N. Y. State Mus., 64, CXXII, 72; Rep. Geolog. Surv. Michigan, 1906, 555.

*Cratægus Gravesii* Sargent, Rhodora, V, 159 (June, 1901).

*Cratægus fallens* Gruber, Proc. Bucks Co. Nat. Sci. Club, I, 19 (*Cratægus* in Bucks County) (1903).

*Cratægus rotundifolia* Eggleston, Gray Man., ed. 7, 468 (in part) (not Moench) (1908).

Lincoln Heights, Scranton, Lackawanna County, A. Twining, (No. 1) May 31, 1907; valley of the Little Juniata River below Altoona, Blair County, B. H. Smith, (No. 263) May 20, 1905, B. H. Smith and C. S. Sargent, September 27, 1905, (No. 268) B. H. Smith, May 20, 1905.

3. *Cratægus grossa* n. sp.

Glabrous. *Leaves* broadly ovate, acute, abruptly cuneate at the wide base or rarely obovate and gradually narrowed at the base, finely often doubly serrate, with straight or incurved glandular teeth, and very slightly divided usually only above the middle into 3 or 4 pairs of short broad acuminate lobes; nearly half-grown when the flowers open the middle of May and then thin, yellow-green, very smooth and lustrous above and pale below, and at maturity thick, dark yellow-green and lustrous on the upper surface, pale on the lower surface, 4.5–5.5 cm. long and 3.5–4.5 cm. wide, with prominent midribs and thin primary veins; petioles slender, slightly wing-margined at the apex, 2–2.5 cm. in length. *Flowers* 1.6–1.8 cm. in diameter, on short slender pedicels, in compact mostly 4–10-flowered corymbs, the lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, the lobes gradually narrowed to the base, short, broad, acuminate, entire or slightly glandular-dentate, reflexed after anthesis; stamens 10; anthers cream color; styles 3 or 4, surrounded at the base by a narrow ring of pale tomentum. *Fruit* ripening the end of September, on short stout erect pedicels, in few-fruited clusters, subglobose to short-oblong, full and rounded at the ends, dull orange-red, marked by numerous pale dots, 8–10 mm. in diameter; calyx little enlarged, with a wide shallow cavity pointed and tomentose in the bottom, and small spreading and appressed often deciduous lobes; flesh thin and hard; nutlets 3 or 4, acute at the base, gradually narrowed and rounded at the apex, rounded and slightly grooved on the back, 5–5.5 mm. long and about 4 mm. wide.

A broad round-topped shrub 1.5–2 m. high, with small ashy gray stems, and slender slightly zigzag often contorted branchlets dark

orange-green and marked by pale lenticels when they first appear, becoming dark chestnut brown and lustrous in their first season and dull gray-brown the following year, and armed with numerous stout or slender slightly curved purple shining spines 3–6 cm. long.

Upland pastures and the borders of woods, common; near Bedford Springs, Bedford County, B. H. Smith and C. S. Sargent, (No. 296 type) September 30, 1905, September 7, 1909, B. H. Smith, May 18, 1906, May 22, 1909; road above Bedford Springs Hotel, Bedford, Bedford County, B. H. Smith, May 22, 1909, B. H. Smith and C. S. Sargent, September 7, 1909; field near cemetery, Bedford, Bedford County, B. H. Smith, (No. 17) May 22, 1909, B. H. Smith and C. S. Sargent, September 7, 1909.

4. *Cratægus dacrioides* n. sp.

*Leaves* rhombic or slightly obovate, acute, acuminate or rarely orbicular and rounded at the apex, gradually narrowed to the long concave-cuneate base, sharply often doubly serrate, with straight glandular teeth, and sometimes slightly divided above the middle into small acute lobes, nearly fully grown when the flowers open about the 20th of May and then very thin, dark yellow-green, slightly roughened by short white hairs and villose on the midribs above and pale and glabrous below, and at maturity thin, dull yellow-green, smooth or scabrate on the upper surface and pale yellow-green on the lower surface, 3.5–5 cm. long and 2.5–3 cm. wide, with thin yellow midribs and primary veins; petioles slender, slightly wing-margined at the apex, sparingly villose on the upper side while young, becoming glabrous, glandular, with minute glands, 1.5–2.5 cm. in length. *Flowers* very fragrant, 2–3 cm. in diameter, on short slender slightly villose pedicels, in small compact 3–5-flowered corymbs, the lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, glabrous, the lobes short, broad, laciniately glandular-serrate, glabrous, reflexed after anthesis; stamens 5 or 6; anthers faintly tinged with pink, soon becoming white; styles 3–5. *Fruit* ripening early in October, obovate, gradually narrowed to the base, somewhat narrowed at the apex, orange-red, lustrous, marked by large pale dots, 1.2–1.5 cm. long and 1–1.2 cm. in diameter; calyx little enlarged, with a short tube, a deep narrow cavity pointed in the bottom, and small spreading often deciduous lobes; flesh yellow-green, dry and hard; nutlets 3, gradually narrowed and rounded at the ends, rather broader at the base than at the apex, ridged on the back, with a deeply grooved ridge, 6–6.5 mm. long and 3.5–4 mm. wide.

A shrub 1–2 m. high, with very slender stems covered with smooth

dark bark, and nearly straight branchlets dark orange-green tinged with red and marked by pale lenticels when they first appear, becoming light chestnut brown and lustrous in their first season and dull red-brown the following year, and armed with numerous very slender straight purple shining spines 4–4.5 cm. long.

Borders of woods, Shade Gap Road, near Orbisonia, Huntingdon County, B. H. Smith, (No. 317 type) May 20, 1906, October 8, 1907.

5. *Crataegus varians* n. sp.

Glabrous. *Leaves* ovate to obovate, acuminate, gradually or abruptly narrowed and cuneate at the entire base, coarsely often doubly serrate, with broad straight glandular teeth, and slightly divided into 3 or 4 pairs of broad acute lateral lobes; nearly half-grown when the flowers open from the middle to the end of May and then very thin, yellow-green, smooth and lustrous above and paler below, and at maturity thin, yellow-green, pale, 5–7 cm. long and 3–5 cm. wide, with slender prominent midribs, and thin primary veins; petioles slender, narrowly wing-margined sometimes nearly to the middle, 2.5–4 cm. in length on the lower surface. *Flowers* 2.5 cm. in diameter, on short slender pedicels, in very compact mostly 5–7-flowered corymbs, the lower peduncles from the axils of upper leaves; calyx-tube broadly obconic, the lobes separated by wide sinuses, gradually narrowed from the base, short, broad, acuminate, entire or occasionally minutely glandular-dentate near the middle, reflexed after anthesis; stamens 10–15; anthers cream color; styles 3 or 4, surrounded at the base by a narrow ring of pale tomentum. *Fruit* ripening and falling at the end of September, on long stout erect or spreading pedicels, in few-fruited clusters, subglobose, dark red blotched with green, marked by numerous large pale dots, 1–1.2 cm. in diameter; calyx little enlarged, with a short tube, a wide shallow cavity, and spreading often deciduous lobes; flesh green and hard; nutlets 3 or 4, gradually narrowed and acute at the ends, or, when 3, broad and rounded at the apex, ridged on the back, with a broad deeply grooved ridge, 6–6.5 mm. long and about 4 mm. wide.

An irregularly topped shrub 3–7 m. high, with several large spreading stems covered with pale scaly bark, small spreading and ascending branches, and slender nearly straight branchlets, dark orange-green and marked by numerous pale lenticels when they first appear, becoming bright chestnut brown and lustrous in their first season and light red- or orange-brown the following year, and armed with stout or slender straight or slightly curved chestnut brown shining spines 2.5–4 cm. long.

Glades in low moist soil surrounded by oak woods, near Bedford Springs, Bedford County, B. H. Smith and C. S. Sargent, (No. 292 type) September 29, 1905, B. H. Smith, May 18, 1906, May 22, 1909.

6. *Crataegus Brownii* Britton.

Bull. Torrey Bot. Club, I, 44 (1900).

*Crataegus Margaretta* Eggleston, Britton, N. Am. Trees, 463 (in part) (not Ashe) (1908); Gray Man., ed. 7, 464.

Orbisonia, Huntingdon County, B. H. Smith, (No. 319) May 20, 1906, B. H. Smith and C. S. Sargent, October 9, 1906; also mountains of Virginia.

7. *Crataegus repentina* n. sp.

Glabrous with the exception of the hairs on the young leaves and petioles. *Leaves* ovate to oval or rhombic, acuminate at the ends, or acute at the apex and abruptly cuneate at the base, finely often doubly serrate, with straight glandular teeth, and slightly divided usually only above the middle into 3 or 4 pairs of small acute lobes usually pointing toward the apex of the leaf; deeply tinged with red when they unfold, not more than one-third grown when the flowers open about the 20th of May and then dark yellow-green, smooth, lustrous and slightly hairy above and pale and glabrous below, and at maturity thin but firm in texture, dark yellow-green on the upper surface, pale on the lower surface, 5–5.5 cm. long and 3.5–4 cm. wide, with thin prominent midribs and primary veins; petioles slender, narrowly wing-margined often to the middle, slightly villose on the upper side while young, soon becoming glabrous, 2–3 cm. in length; leaves on vigorous shoots broadly ovate, acute, rounded at the wide base, coarsely serrate, deeply lobed, and often 5–6 cm. long and broad, with stout conspicuously glandular petioles. *Flowers* 1.8 cm. in diameter, on long slender pedicels, in compact 3–6-flowered corymbs, the elongated lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, the lobes gradually narrowed from the base, long, slender, acuminate, entire or occasionally minutely dentate near the middle, reflexed after anthesis; stamens 10–20; anthers cream color, minute; styles 3 or 4. *Fruit* ripening the middle of September, on stout drooping pedicels, in few-fruited clusters, subglobose to slightly obovate, red, pruinose, 1.2–1.3 cm. in diameter; calyx little enlarged, with a short neck, a deep narrow cavity pointed in the bottom, and reflexed appressed persistent lobes dark red on the upper side below the middle; flesh thin, firm, pale green; nutlets 3 or 4, narrowed and rounded at the apex, acute at the base, rounded and slightly grooved on the back, about 6 mm. long and 4 mm. wide.

A tree or arborescent shrub sometimes 5 m. high, with stems covered with gray scaly bark, spreading and erect branches, and slender only slightly zigzag branchlets dark orange-green and marked by numerous pale lenticels when they first appear, becoming light orange-brown and lustrous in their first season and darker orange-brown the following year, and armed with numerous slender straight or slightly curved shining spines 3-3.5 cm. long and persistent and compound on old stems.

Borders of woods on rich hillsides, near Bedford Springs, Bedford County, B. H. Smith and C. S. Sargent, (No. 14 type) May 26, 1908, September 7, 1909, B. H. Smith, September 17, 1908 and May 22, 1909.

8. *Crataegus scopulorum* n. sp.

Glabrous with the exception of the hairs on the young leaves and on the calyx-lobes. *Leaves* ovate to obovate, acuminate and short-pointed at the apex, cuneate or rounded at the base, sharply often doubly serrate, with straight glandular teeth, and slightly divided above the middle into 3 or 4 pairs of small acuminate lobes; about one-third grown when the flowers open at the end of May and then very thin, concave, yellow-green, roughened above by short white hairs and slightly villose along the midribs and veins below; mature leaves not seen; leaves on vigorous shoots ovate, rounded at the broad base, more coarsely serrate, slightly lobed and often 6-7 cm. long and 5-6 cm. wide, with thick midribs, slender primary veins, and stout broadly winged slightly glandular petioles. *Flowers* 2.5-2.6 cm. in diameter, on short slender pedicels, in 5-12-flowered corymbs; calyx-tube narrowly obconic, the lobes gradually narrowed to the base, long, slender, laciniately glandular-serrate above the middle, sparingly villose on the inner surface, reflexed after anthesis; stamens 20; anthers almost white; styles 3-5, surrounded at the base by a broad ring of pale tomentum. *Fruit* ripening late in September, on slender pedicels, in few-fruited clusters, short-oblong to slightly obovate, orange-red, marked by small pale dots, 8-10 mm. in diameter; calyx little enlarged, with a broad deep cavity, and small closely appressed lobes; flesh red; nutlets 3-5, rounded at the apex, acute at the base, ridged on the back, with a low narrow ridge, 6-6.5 mm. long and about 4 mm. wide.

A shrub 3-4 m. high, with stout stems covered with dark scaly bark and spreading into thickets, and slender slightly zigzag branchlets light orange-green and marked by pale lenticels when they first appear, becoming light chestnut brown and lustrous in their first season and

dull gray-brown the following year, and armed with slender slightly curved shining spines 2.5–3.5 cm. long.

Hillside at the base of Campbell's Ledge, Luzerne County, A. Twining, (No. 32 type) May 30 and September 28, 1907.

9. *Cratægus ignava* n. sp.

Glabrous with the exception of the hairs on the upper surface of the young leaves. *Leaves* broadly ovate to obovate, acute or acuminate, gradually narrowed and concave-cuneate at the entire base, sharply often doubly serrate above, with straight glandular teeth, and divided usually only above the middle into 4 or 5 pairs of small acute spreading lobes; deeply tinged with red and covered above by long white hairs when they unfold, nearly one-third grown when the flowers open about the 20th of May and then dark yellow-green and roughened above by short hairs and pale bluish green below, and at maturity thin, yellow-green, scabrate on the upper surface, 5–6 cm. long and 4.5–5.5 cm. wide, with thin prominent midribs and primary veins; petioles stout, narrowly wing-margined sometimes to the middle, glandular, with occasional minute persistent glands, 2–2.5 cm. in length; leaves on vigorous shoots ovate, rounded or abruptly cuneate at the broad base, coarsely serrate, more deeply lobed, and often 6–7 cm. long and wide. *Flowers* 1.5 or 1.6 cm. in diameter, on long stout pedicels, in compact mostly 5–7-flowered corymbs, the elongated lower peduncles from the axils of upper leaves; calyx-tube broadly obconic, the lobes separated by wide sinuses, long, slender, acuminate, entire or minutely dentate near the middle, reflexed after anthesis; stamens 15–20; anthers light rose color; styles 2–4, surrounded at the base by a narrow ring of pale hairs. *Fruit* ripening late in September, on long stout drooping pedicels, in few-fruited clusters, subglobose or rather broader than long, light green when fully ripe, becoming russet, 1.6–1.7 cm. in diameter; calyx little enlarged, with a wide shallow cavity broad in the bottom, and small spreading lobes dark red on the upper side below the middle and often deciduous from the ripe fruit; flesh thick, firm, light green; nutlets 2–4, usually 3, rounded and obtuse at the ends, ridged and slightly grooved on the back, 8.5–9 mm. long and 6.5–7 mm. wide.

An arborescent shrub 6–7 m. high, with stems covered with gray scaly bark, spreading branches, and slender nearly straight branchlets dark orange-green and more or less tinged with red when they first appear, becoming bright orange-brown and lustrous in their first season and darker-colored the following year, and armed with slender straight or slightly curved chestnut brown shining spines



3.5–5 cm. long, persistent and becoming compound on old stems and branches.

Borders of oak woods, near Bedford Springs, Bedford County, B. H. Smith and C. S. Sargent, (No. 8 type) September 17, 1908, B. H. Smith, May 26, 1908, May 22, 1909.

#### 9. INTRICATÆ.

Leaves usually cuneate; petioles short, glandular; flowers large, opening late, in small few, usually 3–7-flowered corymbs, with generally large conspicuous glandular bracts and bractlets; stamens 10 or less in the following species; fruit late-ripening, subglobose to short-oblong or obovate, sometimes broader than high, red, orange color, bright yellow or russet green more or less blotched with red, 1–1.5 cm. in diameter; flesh hard; nutlets 3–5, rounded at the ends.

Anthers yellow.

Leaves and corymbs glabrous.

Fruit short-oblong to subglobose.

Leaves ovate to oval, 4.5–6 cm. in length, glabrous when young; flowers 2.5–3 cm. in diameter, in 5–8-flowered corymbs.....1. *C. Twiningii*.

Leaves ovate, 3–4 cm. in length, slightly hairy above while young; flowers 1.5–2 cm. in diameter, in 4–6-flowered corymbs.....2. *C. leptalea*.

Fruit short-oblong, orange red.

Leaves ovate, deeply lobed; flowers on slender pedicels, in 5-flowered corymbs, their bracts and bractlets small but conspicuous; fruit occasionally slightly obovate, 8–10 mm. in diameter.....3. *C. fructuosa*.

Leaves ovate to oval, only slightly lobed; flowers on stout pedicels, in 5- or 6-flowered corymbs, with large bracts and bractlets; stamens 6–8; fruit up to 1.4 cm. in diameter.....4. *C. latula*.

Fruit oblong-obovate.

Leaves oblong-ovate.

Flowers on long slender pedicels; fruit russet green with a red cheek.....5. *C. Kinzeræ*.

Flowers on short pedicels; fruit orange color.

6. *C. intricata*.

Leaves oblong to oval.....7. *C. apposita*.

Leaves scabrate; corymbs villose.

Fruit short-oblong to subglobose.

Leaves rhombic to oval, narrowed at the base; flowers in 5–7-flowered corymbs.....8. *C. confusa*.

Leaves ovate, rounded or abruptly cuneate at the base; flowers in 3–5-flowered corymbs.....9. *C. contortula*.

Fruit oblong; leaves broadly ovate and rounded at the base to rhombic.....10. *C. callista*.

Fruit ovate; leaves ovate to oval, cuneate at the base  
11. *C. alpista*.

Anthers rose color or pink.

Leaves smooth and glabrous at maturity; corymbs glabrous.

Fruit short-oblong to slightly obovate, canary yellow.

Leaves ovate to obovate; flowers in 6-12-flowered corymbs; anthers dark rose color.....12. *C. fortunata*.

Leaves oval to ovate; flowers in 5-6-flowered corymbs; anthers light pink.....13. *C. luteola*.

Fruit depressed-ovate to short-oblong, rather broader than high, russet green more or less tinged with red; leaves ovate; anthers faintly tinged with pink....14. *C. Jenningsii*.

Leaves scabrate; anthers pink.

Flowers on densely villose pedicels, in small 3-flowered corymbs; calyx-tube villose; young leaves villose on the midribs and veins below; fruit subglobose to short-oblong.15. *C. scabra*.

Flowers on glabrous pedicels, in broad 3-7-flowered corymbs; calyx-tube and young leaves glabrous; fruit slightly obovate.....16. *C. gratiosa*.

1. *Cratægus Twiningii* n. sp.

Glabrous. *Leaves* ovate to oval, acute or acuminate, abruptly or acutely cuneate at the base, coarsely doubly serrate, with straight or incurved glandular teeth, and slightly divided above the middle into 2 or 3 pairs of short acuminate lobes; tinged with red when they unfold, nearly half-grown when the flowers open at the end of May and then thin, light yellow-green, smooth and lustrous on the upper surface and paler on the lower surface, and at maturity thin, dark yellow green above, pale below, 4.5-6 cm. long and 3.5-4.5 cm. wide, with stout midribs and slender primary veins; petioles stout, broadly wing-margined to below the middle, glandular, with minute persistent glands, often rose color in the autumn, 1.5-2.5 cm. in length; leaves on vigorous shoots broadly ovate and rounded or cuneate at the base, or nearly orbicular, coarsely serrate, more deeply lobed and often 6-7 cm. long and broad, with stout broadly winged conspicuously glandular petioles. *Flowers* 2.5-3 cm. in diameter, on short stout pedicels, in small compact 5-8-flowered corymbs, with large oblong-obovate to linear more or less falcate green coarsely glandular-serrate bracts and bractlets persistent until after the flowers open; calyx-tube broadly obconic, the lobes separated by wide sinuses, foliaceous, short, broad, acuminate, laciniately glandular-serrate above the middle, reflexed after anthesis; stamens 10; anthers yellow; styles 3-5, surrounded at the base by a broad ring of pale hairs. *Fruit* ripening early in

October, on short stout erect pedicels, in few-fruited clusters, short-oblong to subglobose, green tinged with red, 1.1–1.2 cm. in diameter; calyx prominent, with a wide shallow cavity broad and slightly tomentose in the bottom, and small spreading lobes dark red on the upper side; flesh green, dry and hard; nutlets 3 or 4, full and rounded at the ends, broader at the apex than at the base, ridged on the back, with a broad high deeply grooved ridge, 7–7.5 mm. long and 5 mm. wide.

A shrub 1–1.5 m. high, with stems covered with yellow-gray bark, and stout nearly straight branchlets dark orange-green and marked by large pale lenticels when they first appear, becoming light chestnut brown and lustrous in their first season and dull red-brown the following year, and armed with numerous slender straight or slightly curved chestnut brown shining spines 1.5–2.5 cm. long.

Lincoln Heights, Scranton, Lackawanna County, A. Twining, (No. 9 type) June 8 and October 5, 1907, (No. 46) October 5, 1907.

This species is named for its discoverer, Mr. Alfred Twining, of Scranton, who first called attention to the richness of Lackawanna County in forms of *Cratægus*.

2. *Cratægus leptalea* n. sp.

Glabrous with the exception of the hairs on the upper surface of the young leaves. *Leaves* ovate, acuminate, abruptly cuneate or rounded at the base, finely often doubly serrate, with straight glandular teeth, and divided into 3 or 4 pairs of short broad acute lateral lobes; nearly fully grown when the flowers open from the 20th to the 25th of May and then thin, yellow-green and furnished above with occasional white hairs and paler below, and at maturity thin, very smooth, yellow-green, paler on the lower surface than on the upper surface, 3–4 cm. long and 2.5–3 cm. wide, with thin midribs and primary veins; petioles slender, narrowly wing-margined to below the middle, glandular, with minute persistent glands, 1–1.5 cm. in length; leaves on vigorous shoots broadly ovate, rounded or abruptly cuneate at the wide base, more coarsely serrate and more deeply lobed, and often 5–5.5 cm. long and broad. *Flowers* 1.5–2 cm. in diameter, on short stout pedicels, in small compact 4–6-flowered corymbs, with large conspicuous glandular bracts and bractlets, the lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, the lobes foliaceous, acuminate, laciniately glandular-serrate, reflexed after anthesis; stamens 10; anthers white or cream color; styles 4 or 5. *Fruit* ripening in October, on stout erect pedicels, in mostly 3–5-fruited clusters, short-oblong to subglobose, about 1 cm. in diame-

ter; calyx little enlarged, with a short tube, a broad shallow cavity, and spreading usually persistent lobes; flesh thin, green, dry and mealy; nutlets 4 or 5, gradually narrowed and rounded at the ends, rounded and ridged on the back, with a low narrow ridge, 7–8 mm. long and about 4 mm. wide.

A narrow shrub about 1 m. high, with small stems and branches, and slender nearly straight branchlets dark orange-green and marked by pale lenticels when they first appear, becoming dark chestnut brown and lustrous in their first season and dull gray-brown the following year, and armed with numerous very slender nearly straight purple spines 2–3.5 cm. long.

Fields on hills above Bedford Springs, Bedford County, B. H. Smith and C. S. Sargent, (No. 12 type) May 26, 1908, September 7, 1909, B. H. Smith, September 17, 1908.

3. *Crataegus fructuosa* n. sp.

Glabrous with the exception of a few hairs on the upper surface of the young leaves. *Leaves* ovate, acuminate, abruptly or gradually narrowed and cuneate at the base, finely often doubly serrate, with straight glandular teeth, and divided into three or four pairs of short broad acute lateral lobes; not more than one-third grown when the flowers open about the 20th of May and then thin, yellow-green and slightly hairy on the upper side of the midribs, and at maturity thin, yellow-green, smooth and lustrous on the upper surface, pale on the lower surface, 4–4.5 cm. long and about 3.5 cm. wide, with thin midribs and primary veins; petioles slender, slightly wing-margined at the apex, glandular, with persistent glands, 2–2.5 cm. in length; leaves on vigorous shoots ovate, rounded at the wide base, more coarsely serrate, more deeply lobed and often 5.5–6 cm. long and broad, with stout broadly winged conspicuously glandular petioles. *Flowers* 1.6–1.8 cm. in diameter, on slender pedicels, in 5-flowered corymbs, with small but conspicuous glandular-serrate bracts and bractlets persistent until the flowers open; calyx-tube narrowly obconic, the lobes gradually narrowed from the base, long, slender, acuminate, finely glandular-serrate above the middle, reflexed after anthesis; stamens 10; anthers cream color; styles 3 or 4. *Fruit* ripening in October, on short stout pedicels, in few-fruited erect and spreading clusters, depressed-globose, rounded at the ends, deep orange-red, lustrous, about 1 cm. long and 1.2 cm. wide; calyx prominent, with a short tube, a wide deep cavity pointed in the bottom, and spreading persistent lobes; flesh thin, firm, light yellow; nutlets 4 or 5, gradually narrowed and rounded at the ends, rather thicker

at the apex than at the base, only slightly ridged on the back, 5.5–6 mm. long and about 4 mm. wide.

A shrub 1.5–2 m. high, with small ascending stems and branches covered with close dark bark, slender nearly straight branchlets dark orange-green and marked by pale lenticels when they first appear, becoming light chestnut brown and lustrous in their first season and dull reddish brown the following year, and armed with numerous stout nearly straight purple spines 2.5–3 cm. long.

Serpentine Ridge north of West Chester, Chester County, B. H. Smith, (No. 21 type) May 17 and October 5, 1909, B. H. Smith and Dr. W. T. Sharpless, May 22, 1909.

4. *Cratægus lætula* n. sp.

Glabrous with the exception of a few hairs on the young leaves and petioles. *Leaves* ovate to oval, acute or acuminate and often short-pointed at the apex, cuneate or rounded at the base, coarsely doubly serrate, with straight glandular teeth, and very slightly divided above the middle into 2 or 3 pairs of small lobes; more than half-grown when the flowers open about the 20th of May and then thin, yellow-green and furnished with a few hairs along the upper side of the slender midribs and veins, and at maturity thin, dark yellow-green, smooth and lustrous on the upper surface, pale on the lower surface, 3.5–4.5 cm. long and 2.5–3 cm. wide; petioles slender, slightly wing-margined at the apex, sparingly villose early in the season, soon becoming glabrous, glandular, with persistent glands, rose colored in the autumn, 1–1.5 cm. in length. *Flowers* 1.6 cm. in diameter, on long stout pedicels, in broad 3–6-flowered corymbs, with long broad ligulate laciniately glandular-serrate conspicuous bracts and bractlets persistent until after the petals fall; calyx-tube broadly obconic, the lobes gradually narrowed from wide bases, short, acute, laciniately glandular-serrate above the middle, reflexed after anthesis; stamens 6–10; anthers white, becoming pale yellow; styles 3 or 4. *Fruit* ripening in October, on elongated slender pedicels, in few-fruited drooping clusters, depressed-globose, full and rounded at the ends, deep dull red, about 1 cm. long and 1.3 cm. wide; calyx little enlarged, with a deep wide cavity broad in the bottom, and spreading and reflexed often deciduous lobes; flesh thick, yellow, dry and firm; nutlets 3 or 4, gradually narrowed and rounded at the ends, ridged on the back with a low narrow ridge, 5–5.6 mm. long and about 4 mm. wide.

An intricately branched shrub 2–3 m. high, with small stems covered with dark bark, and slender nearly straight branchlets dark orange-green and marked by pale lenticels when they first appear, becoming

light chestnut brown and lustrous in their first season and dull gray-brown the following year, and armed with numerous slender straight chestnut brown spines 3.5–5 cm. long and often pointing toward the base of the branch.

Preston Run Barrens, Newtown, Delaware County, B. H. Smith, (No 246 type) May 27 and September 28, 1904, May 19 and September 29, 1909.

5. *Cratægus Kinzeræ* n. sp.

Glabrous. *Leaves* oblong-ovate, acuminate, gradually or abruptly narrowed to the cuneate base, sharply often doubly serrate, with straight glandular teeth, and deeply divided into 4 or 5 pairs of narrow acuminate spreading lateral lobes; about half-grown when the flowers open in the first week of June and then very thin, yellow-green and smooth above, paler below, and at maturity thin, dark yellow-green and lustrous on the upper surface, pale on the lower surface, 3.5–5 cm. long and 2.5–3.5 cm. wide, with slender midribs and primary veins; petioles slender, slightly wing-margined at the apex, glandular, with minute persistent glands, 1.2 cm. in length; leaves on vigorous shoots thin, rounded or abruptly cuneate at the broad base, more coarsely serrate, deeply lobed, and often 7–8 cm. long and 5–6 cm. wide. *Flowers* 1.5–1.8 cm. in diameter, on long slender pedicels, in small rather lax mostly 5–7-flowered corymbs, with conspicuous oblong-obovate to linear glandular-serrate bracts and bractlets fading brown and persistent until the petals have fallen, the long lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, the lobes gradually narrowed from the base, short, slender, acuminate, laciniately glandular-serrate above the middle, reflexed after anthesis; stamens 8–10, usually 10; anthers large, creamy white; styles 2–4, usually 3, surrounded at the base by a narrow ring of short white hairs. *Fruit* ripening and falling early in October, on slender erect or spreading pedicels, in few-fruited clusters, oblong-obovate, full and rounded at the apex, gradually narrowed to the long slender base, russet-green to russet-orange with a dark red cheek, 1.2–1.4 cm. long and 1–1.2 cm. in diameter; calyx little enlarged, with a wide shallow cavity hairy in the bottom, and small spreading and appressed persistent lobes; flesh thin, hard, becoming succulent when fully ripe, light greenish yellow; nutlets 2–4, usually 2 or 3, broad and rounded at the ends, or, when 2, narrowed and rounded at the ends and rather broader at the base than at the apex, ridged on the back, with a broad low slightly grooved ridge, 6.5–7 mm. long and 4–4.5 mm. wide.

An intricately branched shrub 2–3 m. high, with small spreading

stems covered with dark gray bark, and spreading into thickets, and slender slightly zigzag branchlets, dark orange-green and marked by pale lenticels when they first appear, becoming light chestnut brown and lustrous in their first season and dull red-brown the following year, and armed with only occasional slender straight chestnut brown shining spines 2-2.5 cm. long and sometimes persistent and branched on old stems.

Schenley Park, Pittsburg, Allegheny County, O. E. Jennings, (No. 56 type) May 27, 1906, May 17 and June 8, 1907, O. E. Jennings, October 5, 1907.

This beautiful and distinct plant is named for Miss Grace E. Kinzer, now Mrs. Jennings, the intelligent and zealous assistant of her husband in his botanical labors.

6. *Cratægus intricata* Lange.

Bot. Tidskr., XIX, 246 (1894); Sargent, Rhodora, III, 28; Bull. No. CV N. Y. State Mus., 67, No. CXXII, 104.

Hillside above Bedford Springs, Bedford County, B. H. Smith and C. S. Sargent, (No. 16) May 26, 1908; also New England to western New York.

7. *Cratægus apposita* Sargent.

Bot. Gazette, XXXV, 103 (The Genus *Cratægus* in Newcastle County, Delaware) (1903); Proc. Acad. Nat. Sci. Phila., 1905, 643.

Keyser Valley, Scranton, Lackawanna County, A. Twining (No. 52) June 13, 1907, September 20, 1908; also in Berks, Bucks and Delaware Counties; and in Newcastle County, Delaware.

8. *Cratægus confusa* n. sp.

*Cratægus circur* Ashe, Ann. Carnegie Mus., I, pt. 3, 397 (in so far as relates to Pittsburg, Pennsylvania) (1902).

*Leaves* rhombic to oval, acuminate at the ends, finely often doubly serrate, with straight or incurved glandular teeth, and slightly divided usually only above the middle into 3 or 4 pairs of short broad acuminate lobes; about one-third grown when the flowers open late in May or early in June, and then very thin, light yellow-green and roughened above by short white hairs and paler and sparingly villose on the midribs below, and at maturity thin, yellow-green and scabrate on the upper surface, pale and almost glabrous on the lower surface, 4-6 cm. long and 3-5 cm. wide, with thin prominent midribs and primary veins; petioles slender, narrowly wing-margined nearly to the middle, densely villose early in the season, becoming nearly glabrous, glandular, with numerous persistent glands, 1.2-2 cm. in length; leaves on vigorous shoots thicker, concave-cuneate at the

base, coarsely serrate, often 6–7 cm. long and 5–6 cm. wide. *Flowers* 1.8 cm. in diameter, on short slender villose pedicels, in small compact hairy mostly 5–7-flowered crowded corymbs, with conspicuous oblong-obovate to linear glandular-serrate bracts and bractlets fading brown and persistent until the flowers open, the lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, coated with matted pale hairs, the lobes long, slender, acuminate, finely glandular-serrate, glabrous on the outer surface, slightly villose on the inner surface, reflexed after anthesis; stamens 10; anthers very large, pale cream color; styles 3 or 4, surrounded at the base by a broad ring of pale tomentum. *Fruit* ripening early in October and generally persistent after the leaves fall, on short stout villose erect pedicels, in mostly 2–5-fruited clusters, short-oblong to subglobose, truncate at the apex, rounded or flattened at the base, russet-green with a dark russet-red cheek, marked by numerous dark dots, 1.2–1.7 cm. in diameter; calyx prominent, with a short tube, a wide deep cavity pointed in the bottom, and spreading and reflexed persistent lobes; flesh thin, rather juicy, light yellow-green; nutlets 3 or 4 usually 3, broad and rounded at the ends, ridged on the back, with a broad low ridge, 6.5–7 mm. long and 5 mm. wide.

A shrub 1–2 m. high, with small spreading stems, and stout nearly straight branchlets dark orange-green, villose and marked by pale lenticels when they first appear, becoming dark brown or purple and lustrous in their first season and darker-colored the following year, and armed with occasional slender straight purple spines 4–5 cm. long.

Hillsides, Riverview Park, Allegheny City, Allegheny County. O. E. Jennings and Grace E. Kinzer, (No. 54 type) May 24, 1906. O. E. Jennings, B. H. Smith and C. S. Sargent, October 8, 1906, O. E. and Grace K. Jennings, June 8 and October 14, 1907.

9. *Cratægus contortula* n. sp.

*Leaves* ovate, acute or acuminate, rounded or abruptly cuneate at the wide base, finely doubly serrate, with straight glandular teeth, and slightly divided into 4 or 5 pairs of small acute lateral lobes; nearly fully grown when the flowers open about the 20th of May and then thin, yellow-green and roughened above by short white hairs and villose on the midribs and veins below, and at maturity thin, yellow-green and scabrate on the upper surface and still hairy on the lower surface on the prominent midribs and thin primary veins; petioles slender, slightly wing-margined at the apex, glandular, with minute persistent glands, villose early in the season, becoming nearly glabrous, 1.5–2 cm. in length; leaves on vigorous shoots broadly ovate,



rounded at the base, coarsely serrate, more deeply lobed and often 6-7 cm. long and 5-6 cm. wide. *Flowers* 1.5-1.8 cm. in diameter on short stout pedicels thickly coated with long white glandular hairs, in small compact 3-5-flowered corymbs, with conspicuous glandular bracts and bractlets; calyx-tube narrowly obconic, villose, the lobes abruptly narrowed from broad bases, long, foliaceous, laciniately glandular-serrate above the middle, glabrous on the outer surface, slightly hairy on the inner surface, reflexed after anthesis; stamens 10; anthers cream color; styles 5, surrounded at the base by a narrow ring of pale tomentum. *Fruit* ripening in October, on stout elongated hairy pedicels, in mostly 2-4-fruited clusters, subglobose to short-oblong, green slightly blotched with red (September 6), about 1 cm. in diameter; calyx little enlarged, with a short tube, a wide shallow cavity broad in the bottom, and spreading often deciduous lobes; flesh thin, green, dry and hard; nutlets 5, gradually narrowed and rounded at the ends, narrower at the apex than at the base, 5-5.5 mm. long and 3.5-4 mm. wide.

A shrub 1 m. high or less, with small contorted intricately branched stems, and slender branchlets orange-green and coated with long white hairs when they first appear, still more or less hairy and dark chestnut brown at the end of their first season and dark gray-brown and glabrous the following year, and armed with numerous slender straight spines 1.5-2 cm. long.

Rich hillsides, Bedford, Bedford County; rare; B. H. Smith and C. S. Sargent, (No. 15 type) May 25, 1908, September 6, 1909.

10. *Cratægus callista* n. sp.

*Leaves* broadly ovate and rounded at the base to rhombic, acute and often short-pointed at the apex, sharply often doubly serrate, with straight glandular teeth, and divided above the middle into 3 or 4 pairs of short broad acute lobes; nearly fully grown when the flowers open about the 20th of May and then thin, light yellow-green and roughened above by short white hairs, and slightly hairy below on the slender midribs and primary veins, and at maturity thick, yellow-green and scabrate on the upper surface, scabrate and still hairy on the lower surface, 4-5 cm. long and 3.5-4 cm wide; petioles stout, narrowly wing-margined to below the middle, glandular, with numerous persistent glands, villose early in the season, becoming glabrous, 1.5-2 cm. in length; leaves on vigorous shoots broadly ovate, truncate or rounded at the base, coarsely serrate, more deeply lobed and often 6-6.5 cm. long and broad, with stout broadly winged conspicuously glandular petioles. *Flowers* 1.8-2 cm. in diameter, on stout

sparingly villose pedicels, in small compact 3-5-flowered corymbs, the lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, coated with matted pale hairs, the lobes gradually narrowed from the base, long, slender, acuminate, glandular-serrate above the middle, slightly hairy, reflexed after anthesis; stamens 10; anthers pale yellow; styles 3-5, surrounded at the base by a broad ring of white hairs. *Fruit* ripening early in October, on short stout hairy pedicels, in few-fruited erect clusters, oblong, full and rounded at the ends, orange-red, 1-1.2 cm. long and 8-9 mm. in diameter; calyx prominent, with a wide deep cavity, and enlarged spreading lobes villose and dark red on the upper surface below the middle; flesh thin, yellow, dry and hard; nutlets 3-5, usually 3 or 4, narrowed and rounded at the ends, ridged on the back, with a broad doubly grooved ridge, 6-6.5 mm. long and about 4 mm. wide.

A shrub 1-2 m. high, with numerous small stems, and stout slightly zigzag branchlets dark orange-green marked by pale lenticels and slightly hairy when they first appear, becoming bright chestnut brown, lustrous and glabrous at the end of their first season and dark gray the following year, and armed with numerous slender slightly curved purple spines 2.5-3.5 cm. long.

Thickets near Rockhill Station, Bucks County, C. D. Fretz and C. S. Sargent, (No. 155 type) September 17, 1902, C. D. Fretz, May 22, 1903.

11. *Cratægus alpista* n. sp.

*Leaves* ovate to oval, acuminate, gradually or abruptly narrowed at the base, sharply often doubly serrate, with straight glandular teeth, and slightly divided into 5 or 6 pairs of slender acuminate lateral lobes, yellow-green and covered above by short white hairs and slightly villose on the midribs and veins below when the flowers open about the 20th of May; mature leaves not collected. *Flowers* 1.8-2 cm. in diameter, on short stout densely villose pedicels, in compact 3-5-flowered corymbs, with conspicuous glandular bracts and bractlets; calyx-tube broadly obconic, coated with matted white hairs, the lobes gradually narrowed from wide bases, long, acuminate, glandular-serrate above the middle, villose on the outer surface, glabrous on the inner surface, reflexed after anthesis; stamens 10; anthers cream color; styles 3 or 4. *Fruit* ripening in October, on elongated slender nearly glabrous pedicels, in few-fruited erect clusters, ovate, gradually narrowed and rounded at the apex, truncate at the base, dull red blotched with green, slightly hairy toward the apex, 1-1.2 cm. in diameter; calyx prominent, with a short hairy tube, a

deep narrow cavity tomentose in the bottom, and spreading often deciduous lobes; flesh thin, green and firm; nutlets 3 or 4, gradually narrowed and rounded at the ends, ridged on the back, with a broad high grooved ridge, 6–6.5 mm. long and 4–4.5 mm. wide.

A shrub 1.5–2 m. high, with slender stems, and stout zigzag branchlets dark olive green and covered with long pale hairs when they first appear, becoming light chestnut brown, lustrous, glabrous, and marked by dark lenticels in their first season and dull green the following year, and armed with very numerous slender straight or slightly curved purple spines 2.5–4 cm. long.

Rocky knolls, Orbisonia, Huntingdon County, B. H. Smith, (No. 314 type) May 20, 1906, B. H. Smith and C. S. Sargent, May 27, 1908.

12. *Crataegus fortunata* n. sp.

Glabrous with the exception of the hairs on the calyx-lobes. *Leaves* oval to slightly obovate, acute at the ends and usually 3.5 cm. long and 2.5 cm. wide, to broadly ovate and acute at the apex, abruptly cuneate at the base and usually 3–3.5 cm. long and broad, finely often doubly serrate, with short straight or incurved glandular teeth, and sometimes slightly divided above the middle into 2 or 3 pairs of short broad acuminate lobes; deeply tinged with red when they unfold, nearly fully grown when the flowers open from the middle to the 20th of May and then light yellow-green and smooth above and pale below, and at maturity thin, dark yellow and lustrous on the upper surface, very pale and yellow below, with thin prominent midribs and primary veins, and conspicuous reticulate veinlets; petioles slender, narrowly wing-margined to below the middle, glandular, with minute deciduous glands, 1–1.8 cm. in length; leaves on vigorous shoots broadly ovate, rounded at the wide base, more coarsely serrate and more deeply lobed, and often 4–5 cm. long and wide. *Flowers* 2 cm. in diameter, on short slender pedicels, in small compact mostly 6–12-flowered corymbs, with oblong-obovate to linear glandular-serrate bracts and bractlets fading brown and persistent until the flowers open, the long lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, the lobes long, wide, coarsely glandular-serrate, glabrous on the outer surface, sparingly villose on the inner surface, reflexed after anthesis; stamens 10; anthers dark rose color; styles 2 or 3, usually 3, surrounded at the base by a narrow ring of pale tomentum. *Fruit* ripening late in October, on short slender erect or spreading pedicels, in compact usually 4–9-fruited clusters, short-oblong to slightly obovate, full and rounded at the ends, bright canary yellow, marked by numerous large dark dots, 1–1.4 cm. in

diameter; calyx prominent, with a short tube, a deep narrow cavity, and small spreading and reflexed lobes; flesh yellow, succulent, juicy, bitter and acid; nutlets 2 or 3, rounded at the ends, ridged on the back, with a broad slightly grooved ridge, 6.5–7 mm. long, and 4–4.5 mm. wide.

A round-headed shrub 2–3 m. high, with stout much-branched stems covered with close light gray bark, and slender nearly straight branchlets, dark orange-green and marked by pale lenticels when they first appear, becoming bright chestnut brown and very lustrous in their first season and dark red-brown the following year, and armed with very numerous slender straight purple shining spines pointing toward the base of the branch.

Open pastures, Washington County, Charleroi, O. E. Jennings and Grace E. Kinzer, (No. 34 type) October 7, 1905, May 21, 1906, O. E. Jennings, May 21 and October 14, 1907. Hillside above Twilight, O. E. Jennings, (No. 52) May 21, 1906, and half a mile west of Belle Vernon, O. E. Jennings, (No. 53) October 14, 1907, are probably of this species.

13. *Cratægus luteola* n. sp.

Glabrous with the exception of the hairs on the young leaves and calyx-lobes. *Leaves* oval to ovate, acute or acuminate, concave-cuneate at the base, coarsely often doubly serrate, with broad glandular teeth, and slightly divided above the middle into 2 or 3 pairs of broad acuminate lobes; more than half-grown when the flowers open about the middle of May and then thin, dark yellow-green, very smooth and slightly hairy on the midribs above and pale and glabrous below, and at maturity rather thick, dark yellow-green on the upper surface, light yellow-green on the lower surface, 4–5 cm. long and 3–4 cm. wide, with thick midribs, slender primary veins and conspicuous reticulate veinlets; petioles stout, narrowly wing-margined to below the middle, slightly hairy on the upper side while young, soon becoming glabrous, glandular, with minute persistent glands, 8–10 mm. in length; leaves on vigorous shoots ovate, abruptly cuneate at the base, more coarsely serrate and more deeply lobed, and often 6 cm. long and 5 cm. wide, with stouter broadly winged petioles. *Flowers* 1.8 cm. in diameter, on short slender pedicels, in small compact mostly 5- or 6-flowered corymbs, with large oblong acuminate glandular-serrate bracts and bractlets fading brown and often persistent until the flowers open, the short lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, the lobes separated by wide sinuses, short, broad, acuminate,

entire or glandular-serrate near the apex, glabrous on the outer surface, furnished on the inner surface with a few pale hairs, reflexed after anthesis; stamens 6-10; anthers light pink; styles 3. *Fruit* ripening early in October, on short stout erect pedicels, in few-fruited clusters, subglobose to slightly obovate, light canary yellow, 1-1.2 cm. long, 8-10 mm. in diameter, calyx little enlarged, with a short tube, a deep narrow cavity, and deciduous lobes; flesh green, dry and hard; nutlets 3, rounded at the ends, slightly ridged on the back, about 6 mm. long and 3.5-4 mm. wide.

A shrub 2-3 m. high, with small spreading stems covered with dark gray bark scaly near the ground, small spreading branches, and slender nearly straight branchlets dark orange-green and marked by pale lenticels when they first appear, becoming bright chestnut brown and lustrous in their first season and dull red-brown the following year, and armed with slender straight chestnut brown shining spines 1.5-2.5 cm. long.

Hillsides, very common; Orbisonia, Huntingdon County, B. H. Smith, (No. 304 type) May 19 and 20, 1906, October 8, 1907.

14. *Crataegus Jenningsii* n. sp.

Glabrous. *Leaves* ovate, acute or acuminate, gradually or abruptly narrowed and concave-cuneate, or broad and rounded at the base, coarsely often doubly serrate, with short glandular teeth, and slightly divided into 4 or 5 pairs of short acuminate lateral lobes; about one-third grown when the flowers open late in May and then very thin, light yellow-green and smooth above and pale bluish green below, and at maturity thick, dark blue-green and lustrous on the upper surface, paler on the lower surface, 5-7 cm. long and 4.5-5 cm. wide, with stout midribs, and thin primary veins arching obliquely to the points of the lobes; petioles slender, narrowly wing-margined to below the middle, glandular with persistent glands, often rose color in the autumn, 1.5-2 cm. in length; leaves on vigorous shoots usually concave-cuneate at the broad base, coarsely serrate and often 8-9 cm. long and 7-8 cm. wide, with prominent midribs and primary veins and stout rose-colored conspicuously glandular petioles. *Flowers* 1.8-2 cm. in diameter, on long slender pedicels, in small mostly 5-9-flowered corymbs, with small linear-obovate to linear glandular bracts and bractlets fading brown and generally deciduous before the petals fall, the lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, the lobes gradually narrowed from the base, slender, coarsely glandular-serrate at the acuminate apex, reflexed after

anthesis; stamens 8-10; anthers faintly tinged with pink; styles 3 or 4, usually 3, surrounded at the base by a narrow ring of pale hairs. *Fruit* ripening late in October, on slender erect or spreading pedicels, in generally 5- or 6-fruited clusters, depressed-ovate to short-oblong, flattened at the ends, russet-green to dark russet-red or bronze color, marked by numerous pale dots, 1.2-1.4 cm. long and rather broader than high; calyx little enlarged, with a narrow deep cavity pointed in the bottom, and small spreading and reflexed persistent lobes; flesh thin, hard, light greenish yellow; nutlets 3 or 4, gradually narrowed and rounded at the ends, rather broader at the apex than at the base, ridged on the back, with a broad low slightly grooved ridge, 7-8 mm. long, and 4.5-5 mm. wide.

A shrub 3-4 m. high, with stout ascending stems covered with dark gray bark, stout nearly straight branchlets light orange-brown and marked by pale lenticels when they first appear, becoming dark chestnut brown and lustrous in their first season and dull reddish brown the following year, and armed with few stout straight purple shining spines 3.5-4 cm. long.

Hillsides, Kittanning, Armstrong County, O. E. Jennings, B. H. Smith and C. S. Sargent, (No. 58 type) October 7, 1906, O. E. Jennings, May 27, 1907, O. E. and Grace K. Jennings, October 7, 1907, (No. 51, with calyx-lobes somewhat dilated toward the apex) O. E. Jennings, October 14, 1905, May 28, 1906, O. E. Jennings, B. H. Smith and C. S. Sargent, October 7, 1906.

In associating the name of this species with that of its discoverer, Dr. Otto E. Jennings, head of the Botanical Department of the Carnegie Museum at Pittsburg, I am glad to express my admiration for his skill and industry in making known the flora of western Pennsylvania.

15. *Cratægus scabra* n. sp.

*Leaves* ovate, acute or acuminate, cuneate at the base, coarsely often doubly serrate, with wide straight glandular teeth, and slightly divided above the middle into 3 or 4 pairs of short broad lobes; coated with soft white hairs when they unfold, about one-third grown when the flowers open the middle of May and then thin, dark yellow-green, and roughened above by short white hairs and pale and slightly villose along the midribs and veins below, and at maturity thin, dark green and scabrous on the upper surface, pale yellow-green and scabrous on the lower surface, 5-6 cm. long and 4-5 cm. wide, with stout midribs and primary veins; petioles stout, wing-margined nearly to the middle, conspicuously glandular, 2-2.5 cm. in length; stipules lanceolate, more or less falcate, glandular-serrate, large and con-

spicuous, sometimes persistent until the petals fall; leaves on vigorous shoots usually rounded at the broad base, more coarsely serrate and more deeply lobed, and often 7–8 cm. long and 6–6.5 cm. wide, with lunate foliaceous coarsely glandular stipules. *Flowers* on short stout densely villose pedicels, in small compact mostly 3–5-flowered corymbs, with narrow oblong-obovate conspicuously glandular bracts and bractlets fading brown and persistent until the petals fall; calyx-tube narrowly obconic, densely coated with long matted pale hairs, the lobes short, broad, acuminate, coarsely glandular-serrate above the middle, glabrous on the outer surface, villose on the inner surface, reflexed after anthesis; stamens 5–10; anthers pale pink; styles 3 or 4. *Fruit* ripening early in October, on short slender pedicels, in few-fruited clusters, subglobose to short-oblong, green, about 1.2 cm. in diameter; flesh thin, green and hard; nutlets 3 or 4, broad and rounded at the apex, gradually narrowed and rounded at the base, slightly ridged on the back, with a low narrow ridge, 6–7 mm. long and 4–4.5 mm. wide.

A shrub 1–2 m. high, with small erect stems and branches, slender branchlets, dark orange-green tinged with red and marked by pale lenticels when they first appear, light chestnut brown and lustrous in their first season and dull red-brown the following year, and armed with very numerous slender straight or slightly curved chestnut brown shining spines 2.5–3 cm. long.

Rocky knoll, Orbisonia, Huntingdon County, B. H. Smith, (No. 313 type) May 20, 1906, October 8, 1908, (No. 306) B. H. Smith, May 19, 1906, B. H. Smith and C. S. Sargent, May 27, 1908.

16. *Cratægus gratiosa* n. sp.

Glabrous with the exception of the hairs on the upper surface of the leaves. *Leaves* ovate to oval, acute and often short-pointed at the apex, cuneate at the base, coarsely often doubly serrate, with straight glandular teeth, and slightly divided into 3 or 4 pairs of short broad lateral lobes; when they unfold slightly tinged with red and coated above with short white hairs, nearly fully grown when the flowers open at the end of May and then thin, yellow-green and still hairy above, and at maturity thick, yellow-green and scabrate on the upper surface, paler and lustrous on the lower surface, 3.5–4.5 cm. long and 2–3.5 cm. wide, with thin midribs and primary veins; petioles slender, slightly wing-margined to below the middle, glandular, 1–2 cm. in length; leaves on vigorous shoots broadly ovate, rounded or very abruptly cuneate at the wide base, more coarsely serrate, and often deeply lobed, with narrow acuminate lobes, their petioles

stout, broadly winged and conspicuously glandular. *Flowers* 1.8 cm. in diameter, on long slender pedicels, in wide compact 3-7, usually 5-7-flowered corymbs, with large conspicuous viscid glandular bracts and bractlets mostly deciduous before the flowers open; calyx-tube broadly obconic, the lobes gradually narrowed from wide bases, short, acuminate, sharply glandular-serrate near the middle, reflexed after anthesis; stamens 10; anthers pink; styles 2 or 3. *Fruit* ripening in October, on elongated slender erect or spreading pedicels, in mostly 3- or 4-fruited clusters, slightly obovate, full and rounded at the apex, green blotched with red (September 7th), 8-10 mm. long and nearly as broad; calyx little enlarged, with a short tube, a deep narrow cavity, and spreading and reflexed lobes; flesh thin, green and hard; nutlets 2 or 3, rounded at the ends, rounded and ridged on the back, with a broad low slightly grooved ridge, 5-6 mm. long and about 4 mm. wide.

A narrow shrub rarely 1 m. high, with very slender erect stems and branches, and slender nearly straight branchlets orange-brown and marked by orange-colored lenticels when they first appear, becoming chestnut brown and very lustrous in their first season and gray-brown the following year, and armed with numerous slender straight chestnut brown shining spines 3-4 cm. long.

Fields on hills above Bedford Springs, Bedford County, B. H. Smith and C. S. Sargent, (No. 11 type) May 26, 1908, September 7, 1909, B. H. Smith, May 22, 1909.

#### 10. ANOMALÆ.

Flowers in 8-15-flowered corymbs; anthers rose color; fruit short-oblong to oval, 1-1.5 cm. in length; nutlets usually marked by obscure ventral depressions; leaves cuneate.

Stamens 20; leaves broad-ovate; fruit oval, orange-red; arborescent.....1. *C. putata*.

Stamens 15-20; leaves ovate to oval; fruit short-oblong, dark red; shrubby, spreading into large thickets.....2. *C. errata*.

##### 1. *Cratægus putata* n. sp.

Glabrous with the exception of the hairs on the upper surface of the young leaves. *Leaves* broadly ovate, acuminate, gradually or abruptly cuneate at the base, finely often doubly serrate, with straight glandular teeth, and slightly divided into 4 or 5 pairs of small spreading lateral lobes; about half-grown when the flowers open at the end of May and then thin, yellow-green, smooth, lustrous, and slightly hairy along the midribs above and pale below, and at maturity



thick, dark yellow-green and glabrous on the upper surface, pale bluish green on the lower surface, 6-7 cm. long and 4.5-6 cm. wide, with thin midribs and primary veins; petioles slender, narrowly wing-margined nearly to the base, often rose color in the autumn, 1.8-2.2 cm. in length. *Flowers* 2 cm. in diameter, on long slender pedicels, in mostly 8-12-flowered corymbs, with oblong-obovate often falcate to linear glandular-serrate deep rose-colored bracts and bractlets mostly persistent until the flowers open; calyx-tube broadly obconic, the lobes separated by wide sinuses, gradually narrowed from the base, long, slender, red and acuminate at the apex, minutely glandular-serrate below the middle, reflexed after anthesis; stamens 20; anthers light rose color; styles 2 or 3. *Fruit* ripening early in October on slender pedicels, in few-fruited clusters, oval, orange-red, lustrous, marked by many large dark dots, about 1 cm. long and 8 mm. in diameter; calyx prominent, with a short tube, a deep narrow cavity pointed in the bottom, and small reflexed closely appressed persistent lobes; flesh thin, yellow, dry and mealy; nutlets 2 or 3, usually 3, gradually narrowed and rounded at the ends, ridged on the back, with a broad slightly grooved ridge, marked on the inner faces by slight depressions, 6-6.5 mm. long and about 4 mm. wide.

A tree 5 m. high, with a trunk sometimes 1.5 dm. in diameter, covered with scaly bark, and stout nearly straight branchlets, light orange-green and marked by pale lenticels when they first appear, becoming light chestnut brown and lustrous in their first season and armed with numerous stout or slender nearly straight purple shining spines 4-5 cm. long, often pointed toward the base of the branch, and persistent and becoming branched on older stems.

Virginia, near Scranton, Lackawanna County, A. Twining, (No. 41 type) May 28 and October 1, 1907.

2. *Cratægus errata* n. sp.

Glabrous with the exception of the hairs on the young leaves. *Leaves* ovate to oval, acute or acuminate, gradually narrowed and concave-cuneate at the base, finely often doubly serrate, with straight glandular teeth, and slightly divided usually only above the middle into 3 or 4 pairs of small acuminate lobes; more than half-grown when the flowers open about the 10th of June and then light yellow-green, smooth and slightly hairy along the midribs above and lighter yellow-green and glabrous below, and at maturity rather thick, dark yellow-green, smooth, lustrous and glabrous on the upper surface, light yellow-green on the lower surface, 4-5 cm. long and 3-3.5 cm. wide, with thick midribs, and slender primary veins; petioles stout, slightly

wing-margined at the apex, often rose color below the middle in the autumn, 1–1.5 cm. in length; leaves on vigorous shoots often rounded at the broad base, more coarsely serrate and more deeply lobed, and often 5–6 cm. long and broad. *Flowers* 1.8 cm. in diameter, on long stout pedicels, in mostly 12–15-flowered corymbs, the elongated lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, the lobes gradually narrowed from the base, long, slender, acuminate, finely glandular-serrate near the middle, reflexed after anthesis; petals tinged with pink; stamens 15–20; anthers bright pink; styles 3 or 4. *Fruit* ripening the end of October, on long stout pedicels, in drooping few-fruited clusters, short-oblong, full and rounded at the ends, dark red, lustrous, marked by small pale lenticels, 1–1.2 cm. in diameter; calyx prominent, with a wide deep cavity pointed in the bottom, and reflexed persistent lobes dark red on the upper side below the middle; flesh thin, dry and mealy; nutlets 3 or 4, narrowed and rounded at the apex, acute at the base, ridged on the back, with a broad low ridge, 6–7 mm. long and about 4 mm. wide, and furnished with very shallow depressions on the inner faces.

A broad shrub 3–4 m. high, with small stems covered below with pale scaly bark and smooth above, and spreading into large thickets, and stout slightly zigzag branchlets light yellow-green and marked by pale lenticels when they first appear, becoming light chestnut brown and lustrous in their first season and light reddish-brown the following year, and armed with stout straight or slightly curved purplish shining spines 2–3.5 cm. long, and numerous and persistent on old stems.

Low moist rich soil, Keyser Valley, near Scranton, Lackawanna County, common, A. Twining, (No. 47 type) June 13 and October 22, 1907.

B. Nutlets with longitudinal cavities on their ventral faces (Group Tomentosæ).

#### 11. TOMENTOSÆ.

Fruit obovate to subglobose or short-oblong, orange-red or scarlet, becoming soft and succulent at maturity, 6–12 mm. in diameter; nutlets 2 or 3, obtuse at the ends, prominently ridged on the back; flowers small, opening late, in tomentose or villose rarely glabrous corymbs; leaves thin to subcoriaceous.

Leaves thin with midribs and veins only slightly impressed on their upper surface; stamens 20.

Corymbs villose; leaves pubescent below during the season.

Anthers rose color.....1. *C. tomentosa*.

Anthers pale yellow.....2. *C. structilis*.

Corymbs and mature leaves glabrous.

Flowers in many-flowered corymbs; young leaves glabrous below; anthers white.....3. *C. tanuphylla*.

Flowers in few-flowered corymbs; young leaves villose below; anthers pink.....4. *C. propiza*.

Leaves subcoriaceous, with midribs and veins deeply impressed on their upper surface.

Stamens 20; anthers pink.

Pedicels stout, densely villose; leaves oblong-ovate to obovate, acuminate, slightly hairy on the lower surface; corymbs many-flowered; calyx-tube villose.

5. *C. succulenta*.

Pedicels slender, only slightly hairy; leaves obovate, mostly rounded at the apex; corymbs narrow, 10-15-flowered; calyx-tube glabrous.....6. *C. vaga*.

Stamens 10-15; anthers rose color; pedicels and leaves glabrous.

7. *C. latifica*.

Stamens 10 or less.

Anthers pale pink; calyx-tube of the flower glabrous; fruit ovate.....8. *C. diaphora*.

Anthers yellow; calyx-tube of the flower slightly villose; fruit subglobose to short-oblong.....9. *C. agaia*.

1. *Cratægus tomentosa* Linnæus.

Spec., 467 (1753); Sargent, Silva N. Am., IV, 101, t. 183; Proc. Rochester Acad. Sci., IV, 132; Man., 492, f. 406; Proc. Acad. Nat. Sci. Phila., 1905, 653; Rep. Geolog. Surv. Michigan, 1906, 560; No. 4 Ontario Nat. Sci. Bull., 75; Rep. Missouri Bot. Gard., XIX, 116.

*Cratægus Chapmani*, var. *Plukenetii* Eggleston, Rhodora, X, 83 (1908); Gray Man., ed. 7, 478.

"Scottsdown Road," Allegheny County, J. A. Shafer, June 3, 1903; also New York to Missouri and western North Carolina.

2. *Cratægus strueticilis* Ashe.

Jour. Elisha Mitchell Sci. Soc., XIX, 12 (1903); Sargent, Proc. Acad. Nat. Sci. Phila., 1905, 656; Rep. Geolog. Surv. Michigan, 1906, 562; Bull. Ont. Nat. Sci. Soc., 1908, 76; Bull. N. Y. State Mus., CXXII, 77.

Orbisonia, Huntingdon County, B. H. Smith, (No. 311) May 20, 1906, October 8, 1907, B. H. Smith and C. S. Sargent, May 27, 1908; also in Berks County, and in western New York to southern Ontario and eastern Michigan.

3. *Cratægus tanuphylla* n. sp.

Glabrous with the exception of the hairs on the inner surface of the calyx-lobes. *Leaves* oblong-obovate, acuminate, gradually narrowed to the entire base, finely and often doubly serrate above, and slightly divided above the middle into 4 or 5 pairs of small acuminate lobes; more than half-grown when the flowers open and then thin, dark dull yellow-green above and paler below, and at maturity 6-9

cm. long and 3.5–4.5 cm. wide, with thin midribs and primary veins; petioles slender, wing-margined nearly to the base, 1.5–2.5 cm. in length. *Flowers* 1.2–1.5 cm. in diameter, on long slender pedicels, in wide lax mostly 15–20-flowered corymbs, the lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, the lobes gradually narrowed from wide bases, coarsely glandular-serrate above the middle, densely villose on the inner surface, reflexed after anthesis; stamens 20; anthers white; styles 2 or 3, usually 2. *Fruit* ripening in October, on slender drooping pedicels, in many-fruited clusters, short-oblong, full and rounded at the ends, crimson, lustrous, about 1 cm. in diameter; calyx little enlarged, with a narrow shallow cavity, and spreading often deciduous lobes; flesh yellow; nutlets 2 or 3, rounded at the ends, ridged on the back, slightly penetrated on the inner faces by small irregular grooves, 5–6 mm. long and 3–3.5 mm. wide.

A tree, with slender slightly zigzag branchlets light orange-green when they first appear, becoming dark chestnut brown and lustrous in their first season and armed with numerous stout straight chestnut-brown spines 3.5–4.5 cm. long.

Hollow back of cemetery near Staunton Avenue, Pittsburg, Allegheny County, J. A. Shafer, (No. 21 type) October 1901, May 1902.

This species differs from all the other thin-leaved *Tomentosæ* by the absence of hairs from the leaves and corymbs.

4. *Cratægus propixa* n. sp.

*Leaves* broadly obovate, acute or acuminate, concave-cuneate at the entire base, finely often doubly serrate above, with straight glandular teeth, and slightly divided above the middle into 4 or 5 pairs of small acuminate spreading lobes; nearly fully grown when the flowers open in the first week of June and then thin, dark yellow-green, smooth, lustrous and slightly hairy along the midribs above and pale and villose on the midribs and veins below, and at maturity thin, dark yellow-green, smooth and lustrous on the upper surface, pale and scabrate on the lower surface, 8–9 cm. long and 6–6.5 cm. wide, with thin light yellow midribs and primary veins; petioles slender, narrowly wing-margined to the middle, often rose color in the autumn, 1–1.3 cm. in length. *Flowers* 1.5–1.6 cm. in diameter, on long stout glabrous pedicels, in narrow mostly 10–15-flowered corymbs, the elongated lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, glabrous, the lobes gradually narrowed from the base, long, slender, acuminate, laciniately glandular-serrate above the middle, glabrous on the outer surface, sparingly villose

on the inner surface, reflexed after anthesis; stamens 20; anthers pink; styles 2 or 3, surrounded at the base by a few pale hairs. *Fruit* ripening the end of September. on slender drooping pedicels, in few-fruited clusters, subglobose to ovate, crimson, lustrous, marked by large pale dots, 7–8 mm. in diameter; calyx prominent, with a short tube, a deep narrow cavity pointed in the bottom, and small recurved persistent lobes; flesh thin, yellow, soft and succulent; nutlets 2 or 3, full and rounded at the ends, slightly ridged on the back, with a low narrow ridge, penetrated on the inner faces by broad shallow cavities, 5–5.5 mm. long and about 4 mm. wide.

A shrub 2–3 m. high, with several stout nearly straight stems, and glabrous branchlets light orange-green and marked by pale lenticels when they first appear and light chestnut brown and very lustrous the following season, and armed with numerous slender straight or slightly curved purple shining spines 4.5–5.5 cm. long and compounded and persistent on old stems.

Hillsides at the base of Campbell's Ledge, near Scranton, Luzerne County, A. Twining, (No. 36 type) June 8 and September 28, 1907.

5. *Cratægus succulenta* Link.

Handbook, II, 76 (1831); Sargent, Silva N. Am., XIII, 139, t. 131; Proc. Rochester Acad. Sci., IV, 133; Man., 497, f. 411; Proc. Acad. Nat. Sci. Phila., 1905, 75; Bull. U. S. State Mus., CV, 72, CXXII, 80; Ont. Nat. Sci. Bull., 1908, 92.

Township west of Carnot, Allegheny County, J. E. Shafer, (No. E 4) May 21 and October 17, 1902; also southern Ontario and western New York to southern New England and eastern Pennsylvania.

6. *Cratægus vaga* n. sp.

*Leaves* obovate, acute or rounded and often abruptly short-pointed at the apex, cuneate at the entire base, finally often doubly serrate above, with straight glandular teeth, and very slightly divided above the middle into 3 or 4 pairs of small acute lobes; less than half grown when the flowers open late in May and then thin, yellow-green, smooth, lustrous, and slightly hairy along the midribs above and light blue-green and sparingly villose along the midribs and veins below, and at maturity thick, dark yellow-green, very lustrous and glabrous on the upper surface, still slightly hairy below on the stout conspicuous midribs and primary veins, 4.5–6 cm. long and 3.5–4.5 cm. wide; petioles stout, narrowly wing-margined to below the middle, slightly hairy on the upper side, soon becoming glabrous, often red in the autumn, 1–1.5 cm. in length. *Flowers* 1.6–1.8 cm. in diameter, on long slender pedicels furnished with occasional white hairs, in narrow

mostly 10–15-flowered corymbs, the lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, the lobes wide, elongated, coarsely glandular-serrate, glabrous on the outer surface, villose on the inner surface, reflexed after anthesis; stamens 20; anthers pale pink; styles 2 or 3. *Fruit* ripening late in September, on long drooping pedicels, in few-fruited clusters, ovate to oval, orange-red, lustrous, 7–8 mm. long and 6–7 mm. wide; calyx prominent, with a short tube, a deep narrow cavity, and spreading often deciduous lobes; flesh thin, yellow, dry and mealy; nutlets 2 or 3, rounded at the apex, gradually narrowed at the base, only slightly ridged on the back, penetrated on the inner faces by long deep cavities, about 5 mm. long and 3.5–4 mm. wide.

A shrub 3–4 m. high, with small stems spreading into large dense round-topped thickets, small erect branches, and stout nearly straight branchlets dark orange-green and marked by pale lenticels when they first appear, becoming light chestnut brown and very lustrous in their first season and darker-colored the following year, and armed with numerous slender straight or slightly curved light chestnut brown shining spines 3.5–4 mm. long.

Borders of swamps and in oak woods near Bedford Springs, Bedford County, B. H. Smith and C. S. Sargent, (No. 13 type) May 26, 1908, B. H. Smith, September 17, 1908, May 22, 1909; meadows, valley of the Little Juniata River below Altoona, Blair County, B. H. Smith, (Nos. 267 and 283) May 20, 1905, B. H. Smith and C. S. Sargent, September 25, 1905.

7. *Cratægus lætiflora* n. sp.

Glabrous with the exception of the hairs on the inner surface of the calyx-lobes. *Leaves* obovate, broad and rounded or acute and short-pointed at the apex, gradually narrowed to the cuneate base, coarsely often doubly serrate usually only above the middle, with straight glandular teeth, and occasionally slightly lobed, with broad acute lobes; when the flowers open at the end of May thick, dark yellow-green and very lustrous above and pale below, and at maturity subcoriaceous, glabrous, dark yellow-green, smooth and lustrous on the upper surface, paler on the lower surface, 4–5 cm. long and 3.5–4 cm. wide, with stout midribs, and prominent primary veins connected by conspicuous reticulate veinlets and deeply impressed on the upper side of the leaf; petioles stout, narrowly wing-margined nearly to the base, 8–10 mm. in length; leaves on vigorous shoots thicker, more coarsely serrate, usually acuminate at the apex, 6–7 cm. long and 5–6 cm. wide. *Flowers* 1–1.2 cm. in diameter, on slender pedicels, in

crowded very compact 10-22-flowered corymbs, the lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, the lobes glandular-serrate, villose on the inner surface, reflexed after anthesis; stamens 10-15; anthers rose color. *Fruit* ripening at the end of September, on long drooping glabrous pedicels, in many-fruited clusters, subglobose to ovate, full and rounded at the ends, crimson, lustrous, marked by large pale dots, 1.2-1.4 cm. in diameter; calyx little enlarged, with a deep narrow cavity, and small spreading serrate lobes villose on the upper side; flesh yellow, soft and succulent, nutlets 2 or 3, gradually narrowed and rounded at the ends, ridged on the back, with a broad high deeply grooved ridge, only slightly penetrated on the inner face, by short narrow cavities, 5.5-6 mm. long and about 4 mm. wide.

A handsome tree 3-4 m. high, with a short trunk covered with dark scaly bark, large spreading and ascending branches forming a broad symmetrical head, and stout slightly zigzag branchlets, light chestnut-brown and marked by small dark lenticels in their first season and dull gray-brown the following year, and armed with numerous stout slightly curved chestnut brown shining spines 4-5 cm. long and persistent, compound and very numerous on the trunk and large branches.

Rich hillsides, Bedford, Bedford County, B. H. Smith and C. S. Sargent, (No. 299 type) September 30, 1905.

This species is remarkable in the small cavities of the nutlets.

8. *Cratægus diaphora* n. sp.

*Leaves* obovate to oval, acute and often short-pointed at the apex, gradually narrowed and cuneate and entire at the base, finely often doubly serrate above, with straight glandular teeth, and occasionally slightly divided above the middle into 2 or 3 pairs of small acute lobes; nearly fully grown when the flowers open about the 10th of June and then thin, light yellow-green, smooth, lustrous, and slightly hairy along the midribs above and pale and slightly hairy in the axils of the leaves below, and at maturity thick, yellow-green, glabrous and lustrous on the upper surface, pale and still slightly hairy on the lower surface, 4-5 cm. long and 3.5-4 cm. wide, with thin midribs and primary veins; petioles slender, slightly wing-margined often to the middle, 1-1.5 cm. in length; leaves on vigorous shoots thicker, oval to obovate, more coarsely serrate and often 6-7 cm. long and 5-6 cm. wide, with stout broadly winged rose-colored petioles. *Flowers* 1.8 cm. in diameter, on long slender glabrous or occasionally slightly hairy pedicels, in wide lax many-flowered corymbs, the lower pedun-

cles from the axils of upper leaves; calyx-tube narrowly obconic, glabrous, the lobes long, slender, acuminate, finely glandular-serrate, glabrous on the outer surface, slightly villose on the inner surface, reflexed after anthesis; stamens 10; anthers pale pink; styles 2 or 3, usually 2. *Fruit* ripening in October on long slender glabrous pedicels, in many-fruited drooping clusters, ovate, crimson, lustrous, marked by large pale dots, 1.3–1.5 cm. in diameter; calyx prominent, with a short tube, a wide shallow cavity, and spreading often deciduous lobes; flesh thick, yellow, soft and succulent; nutlets usually 2, rounded at the ends, ridged on the back, with a broad low grooved ridge, penetrated on the inner faces by narrow deep cavities, 5–5.6 mm. long and about 4 mm. wide.

A shrub 3–4 m. high, with numerous small stems covered with gray scaly bark, spreading into large thickets, and stout zigzag glabrous branchlets bright orange-green and marked by pale lenticels when they first appear, becoming bright chestnut brown and lustrous in their first year, and armed with numerous very stout straight chestnut brown shining spines 3.5–6 cm. long and often pointed toward the base of the branch.

Keyser Valley, Scranton, Lackawanna County, A. Twining, (No. 48 type) June 13, 1907, A. Twining, B. H. Smith and C. S. Sargent, September 5, 1909.

9. *Crataegus agaia* n. sp.

*Leaves* obovate to rhombic or oval, acute or acuminate, often short-pointed at the apex, gradually narrowed and cuneate at the entire base, coarsely doubly serrate above, with straight glandular teeth, and slightly divided above the middle into 2 or 3 pairs of small acute lobes; nearly half-grown when the flowers open at the end of May and then thin, yellow-green and roughened above by short white hairs and slightly hairy along the midribs and veins below, and at maturity subcoriaceous, glabrous, dark yellow-green, smooth and lustrous on the upper surface, paler on the lower surface, 5–6 cm. long and 4–5 cm. wide, with thin midribs and primary veins; petioles slender, narrowly wing-margined to below the middle, slightly villose early in the season, soon becoming glabrous, 1.5–2 cm. in length; leaves on vigorous shoots thicker, more coarsely serrate and often 7–8 cm. long and 6–7 cm. wide, with stout rose-colored midribs, more prominent veins and stout rose-colored petioles. *Flowers* 1.8 cm. in diameter, on long slender slightly hairy pedicels, in wide lax 12–20-flowered corymbs, the lower peduncles from the axils of upper leaves; calyx-tube narrowly obconic, sparingly villose, the lobes



broad, short, acuminate, coarsely glandular-serrate above the middle, glabrous on the outer surface, villose on the inner surface, reflexed after anthesis; stamens 8-10; anthers cream color; styles 2 or 3, surrounded at the base by a narrow ring of pale tomentum. *Fruit* ripening in October, on long slender glabrous or slightly hairy pedicels, in many-fruited clusters, subglobose to short-oblong, full and rounded at the ends, dark crimson, very lustrous, marked by large pale dots, 1-1.2 cm. in diameter; calyx little enlarged, with a short tube, a deep narrow cavity pointed and tomentose in the bottom, and spreading reflexed lobes hairy on the upper surface; flesh thick, yellow, soft and succulent; nutlets 2 or 3, broad and rounded at the ends, rounded and ridged on the back, with a broad low grooved ridge, penetrated on the inner faces by broad deep cavities, 6.5-7 mm. long and about 4 mm. wide.

A tree 4-5 m. high, with a short trunk covered with dark gray scaly bark, small spreading branches and stout zigzag glabrous branchlets, light orange-green and marked by large orange-colored lenticels when they first appear, becoming light chestnut brown and very lustrous in their first season and reddish-brown the following year, and armed with numerous stout or slender chestnut brown shining spines 3.5-6 cm. long.

Hillsides, Keyser valley, Scranton, Lackawanna County, A. Twining, (No. 50 type) May 25, June 3 and 13, 1907, September 27, 1909, A. Twining, B. H. Smith and C. S. Sargent, September 5, 1909.